Co-design and Sustainable Development at the Heart of the Evolution of the Agricultural Extension System in Tunisia

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Abstract: This paper highlights the limitations of the Tunisian model of agriculture, which has long been based on the principles of the green revolution (GR). These limitations, as well as new challenges and issues, have helped steer this sector towards a new paradigm, which requires both profitability and sustainability to be achieved through sustainable production. One key to the success of this change is the evolution of the way in which farmers are managed by the agricultural extension system (AES). During the second half of the 20th century, the completely state-run AES focused on the transfer of agricultural technology in a top-down manner to increase production of the main crops and livestock in order to achieve national food security in the short term and food self-sufficiency in the long term. Analysis of ongoing changes shows that, in order help farmers understand the new way of farming, the system is changing by becoming less centralised and getting closer to the farmers, and by adopting certain elements of privatisation for the larger producers. It is clear that this evolution is suffering from a lack of organisation and governing mechanisms among the various stakeholder groups (public, private and professional).

Key words: Tunisia, agricultural extension, new challenges, green revolution, sustainable agriculture, evolution.

Introduction

Agriculture is a strategic sector in the Tunisian economy for three main reasons: first of all, the 10 million hectares of land devoted to crop-growing and pastoralism account for 62 per cent of the country's total area (d'Orfeuil, Lejeune and Thibault, 2013); secondly, it is a mainstay of the economy, particularly in the interior regions, where it is a source of employment for the working population; and thirdly, imported products are offset by the export of agricultural products, which helps bolster food security.

Throughout the history of farming in Tunisia, there has been a correlation between agricultural development and agricultural extension. The GR model advocated by the state-run, centralised agricultural extension (AE) mechanism is now facing new challenges – namely, the depletion and deterioration of natural resources, climate change, growing land scarcity, price sensitivity of agricultural inputs and volatility of international markets, differentiation between regions and between farmers, and deterioration in product quality. Today, the country has no choice but to dispense with this model of intensive production, with all its positive and negative aspects, in favour of one that will resolve or overcome these inconsistencies. At the same time, state-run AE – which is diffusionist and has fewer and fewer means and personnel to deal with the growing number of small farms run by individuals – is no longer able to respond to the needs of all farmers, or meet new challenges. It needs to move to a model that is closer to the farmers, who, for their part, need to organise themselves to ensure collective management of their farms and resources. This requires change at an institutional level and in the way AE works. Given the current budgetary deficit, new ways of organising the AES to bring it closer to the producers are recommended, particularly in relation to the various participants involved in the processes of liberalisation and privatisation.

The aim of this draft paper is to describe this changeover from a linear, diffusionist system to a multi-party network approach, and to examine the possibility of farmers adapting to new production methods that will facilitate the transition to sustainable development.

This paper is the result of a bibliographic review and fieldwork carried out in several Tunisian governorates (Tunis, Sidi Thabet, Nabeul and Bizerte) in 2016 and 2017. It is based on semi-structured interviews with AE agents of all backgrounds and is part of a wider scientific collaboration with INRA – the French national institute of agricultural research in Dijon – and INRAT – the Tunisian laboratory for the rural economy in Tunis.

Agricultural policy issues during the post-independence period

After independence, Tunisia faced increasing problems of food security as a result of a growing population and a non-market-oriented agricultural system (Potin *et al*, 1986). The country placed particular importance on its agricultural sector, to which both its food security and trade balance in terms of food products are strongly linked (Chahed, Besbes and Hamdane, 2015). At the end of the 1960s, policy focused on the quest for food self-sufficiency, which led the country to embrace the green revolution (Qamar, 2007). This policy encouraged the expansion of irrigated zones, promotion of high-yield crop varieties and the use of agricultural inputs recommended by scientists. This model led to "a growth in agricultural production greater than that of the population" (d'Orfeuil, Lejeune and Thibault, 2013, p.36) and an improvement in the import coverage ratio – particularly for cereals and raw materials – through the export of traditional products where Tunisia has a comparative advantage, such as olive oil.

A diffusionist state model of AE

There was no specific institutional management of AE, which was considered a secondary activity and delegated to various entities. In the 1960s, offices responsible for AE, such as the Office National de Huile (national office for oil), encouraged growth in production by subsidising inputs, taking over the treatment of various disorders, collecting outputs and exporting them to international markets (Elloumi, 2015). In 1991, the AE resurrected the GR in the form of a project co-financed by the World Bank and which helped farmers – particularly those in areas with the potential for greater production (the north) – increase production, reduce costs per unit and increase their profit margin (Bellakhal, 1993).

In terms of organisation, AE was a centralised, state-run pyramid structure. The model is built on the principle of production – distribution – consumption. Technological packages are trialled by the agricultural research station as "scientific advances", which are then passed on to the farmers via agricultural extensionists, who provide feedback to the scientists on the results of the application of the new knowledge. By using this type of 'top-down' approach, the AE is considered part of the education system, in that it aims to help farmers solve problems (Alaadrah and Aubert, 2015) and adopt new practices to improve their means of subsistence by increasing agricultural revenue and guaranteeing household food security.

In general, AE focuses on those farmers who are first to use the new technologies – the 'early adopters' (Alaadrah, 2012). They are then expected to spread the word to other interested farmers, who will copy them.

Analysis of AE shows that this method of managing innovation is not efficient, largely due to the hierarchy among the research centres, AE and the farmers. Within it, AE is merely a distribution channel, and the scientists remain at a distance, in their ivory towers, disconnected from what is happening on the ground. As a result, the actual needs of the farmers, for whom all these innovations are developed, are not taken properly into account (Faure *et al*, 2004). Furthermore, this model of AE originates from a national study based on a macro-economic analysis, on the basis of which global indicators were drawn up and development goals were set for agriculture (Alaadrah and Aubert, 2015). So the AE supports national development goals, the achievement of which is set out in plans of action for producers. Farm size is barely considered, and the farmers are not in a position to adopt or

adapt to the recommendations, especially as not all of the technological packages are available on the market, or they are not affordable. All of this casts doubt on the diffusionist model of AE.

Such doubt is confirmed by numerous critical analyses of this concept of AE, such as Labarthe´s (2006), in which it is described as a service relationship which cannot merely be a channel for transmitting information between a supplier and a beneficiary. The shortcomings of the traditional AE approaches – based, as they are, on a linear relationship between the scientist, the extensionist and the farmer – are further highlighted by the facts that the farmers themselves have certain empirical knowledge and that developing new technologies requires a good understanding of the rural environment in which they are to be used. A deeper understanding is required of a system of agricultural knowledge and innovation that does not just work in a linear way but also takes into account the farmers´ know-how and the interaction between the various parties involved.

Public authorities in various countries have taken these points on board in reforming their AE mechanisms. In Tunisia, the aim at the end of the 1980s was to establish professional organisations (POs), which were required to help identify farmers' needs, initiate research projects, test and eventually roll out proposals (Elloumi, 1993). To cope with commercialisation and new technical systems, the role of previous structures set up in the 1960s and managed by farmers either in the form of agricultural cooperatives or specific sectoral associations had to change. The aim of these structures was to manage natural resources, particularly water, and to organise the supply of services, both upstream and downstream.

Towards tentative decentralisation in Tunisia

The decentralisation process in Tunisia was triggered by two events: the implementation, in 1986, of the structural adjustment plan (SAP), and the ministry of agriculture's budget deficit. These were the two main drivers behind a progressive disengagement by the State from AE services in favour of the establishment of the POs. This was a twofold evolution, in that the structure of the AE programme became less concentrated and the role of the POs was promoted more.

Managing the planning of AE activities

Overview of the AES

To ensure that AE would be closer to beneficiaries, it was placed under the control of the Commissariats Régionaux du Développement Agricole (Regional Commissions for Agricultural Development) (CRDA), at the regional 'Wilaya'[1] level. The CRDA have financial autonomy (ONAR, 2006; Oueslati, 2011). Within the CRDA, the AE division coordinates territorial extension centres (TECs) at Moutamadia/delegation level. Each TEC heads a group of agriculture sector cells (ASCs) at Imada/sectoral level, which are in direct contact with the farmers. The head, or supervisor, of the TEC manages the centre and supervises the extensionists in terms of weekly planning, allocation of materials, transport and equipment, and technical monitoring and support.

The TECs are highly specialised in the production of whatever their region's speciality is ─ for example, artichokes in Sidi Thabet, strawberries in Korba and citrus fruits in Manzel Bou Zelfa. This specialisation goes back to the 1990s, when the World Bank divided the Tunisian agricultural economy into 21 strategic, state-run sectors, such as olives, dates, citruses,

[1] Administratively, Tunisia is divided into Wilayas (governorates), which are further divided into Moutamadias (delegations), which are divided again into even smaller, sector-level units called Imadas.

potatoes, etc. Each governorate is required to focus on a maximum of five sectors, and the extensionists must take into account the strategic production of their delegation, as part of the CRDA.

In addition to AE services, the under-resourced extensionists are required to carry out other tasks: encouraging and processing requests for credit, collecting operational farming data, monitoring the digging of wells, preparing invitations to AE meetings, sending a monthly report to management, etc. Most of the extensionists' time is taken up with these tasks, to the extent that they have little time left to devote to extension activities themselves.

State-run AE in Tunisia receives pedagogical support,[2] at the national level, from the Agence de la Vulgarisation et de la Formation Agricole (agricultural extension and training agency) (AVFA). It was created on the back of the structural adjustment plan and incorporated into the 'agricultural extension master plan' (Bellakhal, 1993). This placed particular emphasis on AE activities, drawing them all together into one specific body specialising in AE by separating research and training. The directorate of training, research and extension was split into two institutions: l'Institution de la Recherche et de l'Enseignement Supérieur Agricoles (institution for research and higher education in agriculture) and the AVFA. The latter is in charge of implementing AE programmes and carrying out professional agricultural training within the framework of the country's economic and social development plans.

In addition, the various offices, interprofessional groups and technical centres are secondary providers of specialist state-run AE services (World Bank, 2006; Behi and Mabrouk, 2014).

We can deduce from this that the AES evolved according to the context and objectives of agricultural policy. Prior to the SAP, agricultural extension, as practised in colonial times, followed a top-down model, the main objective of which was to increase agricultural production; at the end of the 1980s, the SAP, with the weight of the World Bank behind it and in the context of the GR, brought extension closer to the farmers. The result was a multitude of parties involved in the state-run AE activities, poorly coordinated among themselves, and dilapidated state-run AE services lacking in both human and material resources at field level.

The bottom-up method, or deconcentration in the approach to AE

Since 1990, the top-down approach has been prohibited in state-run AE, in favour of more participatory approaches, starting from the base. The aim is to develop AE programmes from the starting point of local needs, because farmers are only interested in extension activities if they correspond to their needs. As one extensionist said: "You will notice that very few farmers will come to a seed-drill servicing day in Sidi Thabet because the farmers there hire equipment that is already serviced."

Programme development starts every year in May, when the AVFA sends out an introductory bulletin outlining the programme for the AE campaign for the following year. In addition, it sends a list of strategic themes prescribed by the ministry of agriculture. From the AVFA the bulletin follows the hierarchical path all the way down to the ASCs. Each extensionist, on receiving the bulletin, prepares the new programme by evaluating previous ones to determine what has not been done and what needs to be stepped up, taking into account the prescribed themes sent by the AVFA. The extensionist then contacts all the parties involved: the regional agricultural union, the POs, retailers of agricultural inputs and the target group of regional farmers.[3] In this way, the extensionist works out a provisional programme which sets out the

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[2] Updating extension documentation and organising the dissemination of new techniques by way of training days, field demonstrations and printed and audio-visual support materials.

[3] These target groups comprise farmers who act as contacts for all the farmers in the region. Essentially, they are representative of the sector and the problems encountered by all.

plan of AE activities (locations and dates) for the Imada.[4] This programme then goes through the TEC and the CRDA for recapitulation and any adjustments according to the financial, logistical, teaching and human resources available from the AVFA. The latter then consolidates all the programmes into a final report and allocates pedagogical support. Once it has been approved, the annual programme takes the top-down hierarchical route so that it can be implemented by the extensionist, starting from September.

This type of deconcentration is criticised for having no real contact with either the scientists or the professionals, and for being an administration-heavy, downward process (Richard, 2006; World Bank, 2006; Elloumi, 2008).

However, although it may seem that the programme, in terms of strategic outputs, is merely meeting public policy objectives, it does actually correspond to the needs of the majority of farmers. This goes back to the fact that the regions specialise in strategic products and the majority of producers are involved.

Finally, given the means available and the extensive circulation of the programme, during which its content is changed or adjusted, the resulting programme is a fairly good reflection of reality.

Promoting the position of professional organisations

In 1986, the 'master plan for agricultural extension' envisioned the transfer of AE to the farming profession. The POs, having been left out of earlier agricultural policies, diversified in order to change farmers' methods (Bessaoud, 2008). Under the master plan, the Coopératives des Services Agricoles (agriculture cooperatives) (CSA) benefited from active promotion in the 1980s, having been discredited as a result of the failure of the experiment to socialise the Tunisian economy in the 1960s.

In 1999, new efforts to reform AE[5] required all associations involved, including the POs, to form Groupements de Développement de l'Agriculture et de la Pêche (agriculture and fishing development groups) (GDAP). Likewise, all CSA had to turn themselves into Sociétés Mutuelles de Services Agricoles (mutual agricultural services organisations) (SMSA).[6] These rearrangements were born out of the State's desire to integrate activities at local level and eliminate duplication of effort between local institutions, in order to have a single point of contact for the implementation of agricultural and rural policies (FAO and UMNAGRI, 2013).

Limitations of the GR model

AE plays an important role in managing how farmers adopt GR principles, the effectiveness of which is measured in terms of the increase in productivity per hectare. But this effectiveness is really only evident among the large producers and in the richest zones, which have the water resources for irrigation. "The water-saving infrastructure installed has reinforced existing regional disparities: the north and central regions of Tunisia encompass 89 per cent of the country's total irrigated surface area" (d'Orfeuil, Lejeune and Thibault, 2013, p.36; Daoud, 2011). This highlighted a stark territorial and social inequality between the regions, most clearly between coastal and interior regions, where agriculture is the main pillar of the economy. Moreover, this model had negative effects: draining of water resources, degradation of water and soil quality, mass unemployment (Rastoin *et al*, 2012). Given these challenges, North Africa and the Middle East could become, at a macro level, the world

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4 There is one extensionist per Imada, or sometimes for several Imadas.

5 Law no. 99-43 of 10 May 1999 on development groups in the agriculture and fishing sector.

6 *Journal Officiel de la République Tunisienne*, no.83, p.2683, 18 October 2005.

region most at risk of food insecurity (Hervieu *et al*, 2008). Further, agricultural growth in recent years has been lower than that of the economy as a whole. The sector is unable to realise its productive potential, with a deficit estimated by the World Bank to be between 40 and 60 per cent d'Orfeuil, Lejeune and Thibault, 2013). One example, cited by Elloumi (2015), showed that the country's trade balance went into deficit because of the sharp declines in the production of olive oil in 2014 and of cereals in 2013. In fact, this whole model was called into question by the drop in olive oil exports and the simultaneous explosion in cereal imports, along with higher prices of essential products on the international market. All of these problems highlight the inefficiency of a model of agricultural development based on large-scale use of natural resources and progressive disengagement of the State from the agriculture sector.

New challenges in Tunisian agriculture

As well as the challenges behind the failure of this model, the prospects for the future of agriculture in Tunisia are hampered by the emergence of new constraints.

Climate change

In Tunisia, climate change manifests in the form of climatic variations and frequent droughts (higher temperatures and lower rainfall). This has led to significant inter-annual variations in agricultural output and its contribution to national wealth creation. The problem is exacerbated by the under-exploitation of irrigation zones: "85 per cent of the available water-saving resources are actually in use and only 330,000 of the 420,000 hectares that could potentially be irrigated have been" (d'Orfeuil, Lejeune and Thibault, 2013, p.36).

Depletion of natural resources

Under the GR model, agricultural policy exploited non-renewable natural resources ─ groundwater and soil ─ in order to profit from high value-added export products. In terms of water resources, in the 1960s water-saving infrastructure was installed under the policy to store water, with a view to expanding the irrigation zones. Distribution networks between the regions were also set up and the irrigation zones were converted. The traditional methods of irrigation used, such as the immersion and furrow techniques, were based on large-scale use of water resources and so seemed inefficient because of the under-exploitation.

As for soil, the polyculture system, i.e. planting multiple crops in the same year, is not widely practised in Tunisia, as confirmed by Elloumi (2015, p.134): "The majority of irrigation zones are operated in the same way as rainfed farming, with one crop per year." This means that soil fertility and bio-pests are not well managed ─ a fact reflected by the difficulty of obtaining maximum yields. Furthermore, Ghersi (2002) noted the lack of drought-resistant seeds, or equipment that does not damage fragile soils, i.e. those that are easily eroded and lack humus.

Political upheaval

The aforementioned problems got even worse after 2010 and the 'Arab Spring'. The Tunisian economy slowed down and employment rose, particularly in rural areas. The revolution in 2011 was, for farmers, a massive and brutal shock, which turned their work and way of life upside down. It also laid bare imbalances in terms of the regional divide and social inequality between town and country. In this context, and given the volatility of prices for agricultural products on the global market, the principal objectives of agricultural policy are to maintain and develop rural employment and access to affordable food (d'Orfeuil, Lejeune and Thibault, 2013).

Towards new agricultural models

The new challenges highlight the need to overhaul the agriculture sector and respond to new issues. To this end, sustainable management of farming is required to meet the growing needs of the population (in terms of food and employment), conserve resources and support farming families.

In 2011, with the help of donors, Tunisia adopted a new agricultural policy built around three strategic themes: food security, promotion of exports and management of natural resources. The policy comprises three strategic aims (Ben Said *et al*, 2011):

- Improving both the institutional framework and coordination of parties involved;
- Improving the supply of public services as an exemplar; adapting agronomic research and AE services to upgrade farms;
- Optimising Tunisia's entry into the international economy.

So it could be said that for farmers, embracing a greener way of farming was not a choice but an obligation. In any case, awareness is not yet universal. The aim of the new model is to achieve higher revenue for the farmer through better farm management as a result of adopting and mastering new techniques relevant to needs. For example, saving irrigation water comes under the aim to change from managing supply to managing demand. Adoption of this policy will pass through several stages, an essential one being reform of the AES in order to be able to adapt to new political and socio-economic requirements.

Obligatory and optional reform of the AES

Upgrading the agricultural sector to enable it to face new issues and constraints, particularly on the international market, is the framework within which AE will evolve. The goals of AE will expand beyond improving the lives of farmers to cover rural life in general, including people who do not own any land, young people living in rural areas and other vulnerable groups. However, institutional reform, in terms of decentralisation/privatisation, has recently become an urgent economic imperative (Bessaoud, 2008). In reality, the State, because of budget problems, is no longer able to replace all its civil servants who are about to retire. Consequently, many ASCs, as noted in the Moutamadiah of Sidi Thabet, have had to close because their staff numbers were getting lower and lower. Also, during the revolution, many service vehicles were burnt out and fleets were not replaced, leaving the extensionists unable to travel to the field. Moreover, we have noticed that farmers are less and less interested in state-run AE. This is partly down to the extensionists not being able to get to them but also because farmers have long associated AE with the supply of strategic inputs, and now that supplies have decreased, they are no longer interested.

Finally, the lack of business and management advice from the State, together with the bureaucracy involved, have created conditions favourable to the rise of the private sector.

Various reforms

Having been tasked with the marketing and uptake of materials, the POs were also called on to run AE activities (Oueslati, 2011). For example, the Groupement des éleveurs de la Race Tarentaise (Tarentaise breeders group) (GERT), set up in 2005, recruited three technicians to help members with milk recording, a public service that had been delegated to them.

The role of agricultural advisor was created by law (no.34-98) in May 1998.[7] Most of the private-sector advisors are former civil servants and so are very experienced. Their

[7] See the website of the chamber of agricultural advisors: http://www.csnca.net/qui-sommes-nous-49.html

educational development is supported by the State via training offered free of charge by the AVFA and the Agence de Promotion des Investissements Agricoles (agricultural investment promotion board) (APIA). The process to reorganise the parties involved in AE is ongoing, for various reasons. The POs, for their part, have stagnated; their number is not increasing, say agents, because competition between farmers is preventing them from uniting together. Membership of the POs among farmers remains very low, at 4 per cent (MARHP, AVFA and GIZ, 2015) and the turnover of dairy, fruit and vegetable cooperatives is decreasing (World Bank, 2006).

What's more, bringing together the functions of all associations into one agricultural development group is unlikely to succeed because there is no real common interest between an association that manages water-collection points and one that represents tomato-growers (World Bank, 2006).

As for the private sector, Labarthe (2008) confirmed the negative effect of privatising AE as the segmentation of advice provision, leading to the potential exclusion of those farmers who do not have the financial means to pay for such a service. But the impact of the private sector varies, depending on the type of advice. Where it is separate from the sale of products the impact on agriculture is limited, given the small number of farmers affected. This could be explained by the predominance of small farms whose operators are not able to pay for advice. Also, the low number of advisors – just 110 were active in 2016 – means they are not accessible to all farmers. If we consider those who sell agricultural products as private advisors, then they are the ones most regularly consulted by small farmers.

On the legal side, the POs and the private sector are seen and effectively act as a supplementary mechanism to the administration, because they are under the control of and sit within the ministry of agriculture and fishing, as well as the AVFA, at the national level, and the CRDA, at the regional level. As a result, their financial autonomy and ability to react to the technical and economic requirements of the market are limited (World Bank, 2006).

Consequently, despite efforts to reform the AES, it remains diverse, diffuse and badly coordinated. The processes to decentralise it are not clear enough, those to privatise it are not forthright enough. "The upshot is that, after almost 20 years of liberal policy, farmers have been left to their own devices, without any technical assistance, apart from those who can afford to pay for the services of occasional private advisors" (Elloumi, 2015, p.135).

Conclusion

The agricultural reference model is outward-looking (seeking inputs from outside and replacing natural factors with artificial ones), capitalist and reliant on particular resources in terms of artificialisation and universal knowledge, and with a plan that does not really correspond to the context. Linked to this model is a state-run system of AE, the aim of which is to ensure food security for the country via the international market.

This model, derived from the GR, is not universally applied and signs are increasing that it is about to collapse, so the challenge now is to find a model that is sustainable economically, environmentally and socially, and which can be adapted to different regional contexts. We envisage, for the future, an AES whose objective is not purely agricultural – rather, it will be a participatory system based on the collective know-how of farmers, backed up by relevant scientific research. It will be a multi-party system in which the farmer is no longer restricted to implementing changes mandated by the administration. Given the lack of state AE resources for small farmers, they will have to organise themselves into production groups, which will act as intermediaries between producers and state and private advisors. In this way, the groups will be able to pay for private advice, especially those that are subsidised by the State, which will therefore retain a controlling role.

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