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Determinants of organisational and institutional innovation in the horticultural sectors of ACP countries

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Introduction: Innovation is a central part of agriculture's adaptation to development issues linked to poverty reduction, the protection of environmental resources and competitiveness. In the horticulture industries (bananas, mangoes, citrus fruits, green beans, flowers, etc.) of the African, Caribbean and Pacific (ACP) countries, logistics innovations (maritime shipping, reefer ships, cold chain) related to the globalization of companies partly explain the growth of international trade.[1] [2] The concept of innovation encompasses various disciplines (economics, sociology, management, etc.), outputs (products and processes) and characteristics (technological, organisational, institutional, etc.). Transversely, innovation refers to the processes of interaction that generate knowledge from which inventions originate and that integrate the invention into the production system, procedures and global value chains (Temple et al., 2011). These processes are governed by institutional variables related to market access conditions (logistics, standards and regulations), resources (input, information, knowledge and funding) and the rules of social cohesion (values, culture and politics). They are sped up by entrepreneurs from major stakeholders, central to which are companies.We propose to explain how the development of horticultural products of ACP countries to supply local, regional or international markets is related to determinants of innovation. We will structure the analysis by distinguishing between the exogenous or endogenous nature of these determinants in relation to the geographic location of the innovations. The objective is to create an analytical framework for understanding public sector innovation policies and the investment strategies of businesses, producer organisations and NGOs.[1] All production, trade and service businesses with horticulture as the main activity.[2] Broad definition of the horticulture of all products (fruits, vegetables, flowers, etc.) with characteristics such as perishability, fragility, etc. that determine technological innovations.

Exogenous determinants of technological innovation

The horticultural export sector of a country often depends on foreign investment (Kenya, Morocco, Cameroon, etc.) to supply international markets[3], build value in businesses (relocating to developing countries or supplying the northern hemisphere out-of-season) and to diversify income and employment. Such investments are usually implemented by internationalised businesses (multinationals, agri-food industries) and sometimes by pluriactive urban entrepreneurs. These businesses mobilise an industrial production method that is characterised by employing a salaried workforce, by dividing labour between farms, by crop monoculture management requiring significant industrial input and capital, by large-scale standardisation and often by the integration of agricultural industries. This means that the same company carries out the entire operation including plant breeding, production, packaging, transportation and even ripening and product distribution. Three dominant sets of variables guide the technological innovation process in these industries.

Institutional variables of international market access

Market access conditions in industrial Organisation for Economic Co-operation and Development (OECD) countries are linked to changes in trade regulations, a notable example being that of the European Union and

the common market organisations, which set the conditions for cost competitiveness (such as exemptions and taxes) between the different countries of origin. Adjusting these conditions requires a competitive innovation policy. For example, the competitive tendering of African, American and Caribbean bananas structures technological investments in order to reduce production costs: substitution of capital for labour in the West Indies, improving quality in Africa, etc.

International market access conditions are further controlled by international standards. These standards, which have been the focus of attention for some time due to concerns about product health conditions, have increased in scope since the 90s to take into account externalities of both an environmental (pesticide pollution and environmental energy audits) and a social (corporate social responsibility) nature. Mainly developed in international organisations (Food and Agriculture Organization (FAO), International Labour Office (ILO), etc.), these standards guide business strategies towards technical and organisational investments, which in turn can lead to reactive strategies to meet standards, or to proactive institutional strategies via lobbying to impact their conditions of preparation[4] or their circumvention (exemptions). In emerging markets, such as for organic and fair-trade products, these standards create new opportunities for organisational innovations to promote the products of ACP countries.

Organisational variables in the search for economies of scale in logistics

International horticulture companies dominate the finalised strategies to maximise value chains for the return of invested capital[5]. One determinant of optimisation is the logistical performance between transfer activities and marketing of focussed products in industrial country markets. This is measured by the concentration of distribution or of the industrial processing sector. Economies of scale[6] and increasing returns[7] are sought. Such optimisation takes horticultural specificities into account (perishability, fragility and climacteric) and forces businesses to innovate in some dominant technologies, such as the homogenisation of the post-harvest preparation of products.

This capacity for innovation favours the vertical integration of certain industries.

Socio-political variables in externalities related to development

The development of horticultural exports in ACP countries generates added value of which the distribution between salaried income, tax revenues and remuneration of financial assets not only creates jobs, but also diversifies export revenues for states. This development is based on a predominant productive model of industrial agriculture and creates pockets of modernised agriculture. These contributions to economic and technological development are central points encouraging the private and public sectors to invest in technology at both national and international levels (Maertens and Swinnen, 2009).

This development also creates negative environmental externalities (Wilson and Otsuki, 2004), resulting in long-term hidden costs (wastewater treatment, use of pesticides, healthcare costs for populations, reduced life expectancy, loss of biodiversity, etc.). Hidden costs are further highlighted by current environmental and social crises and receive more and more media coverage because of information and communication technologies. They increasingly mobilise different civil society organisations and international public institutions. They also influence the end consumers of these products, thereby becoming elements of industrial competition. It is necessary to take account of these externalities in order to steer technological innovation processes. The chlordecone pollution crisis in the West Indies is an example of this.

Endogenous determinants of innovation

Horticultural sector investment in ACP countries is also governed by the growth of regional markets afforded by the explosion of urban markets (Dury et al., 2004). These regional markets are emerging through the development of complementary production areas that supply cities[8]. Their growth leads to agricultural innovations, characterised by dominant family production methods that require little industrial input or capital and which optimise the potential complementarity between plants: related systems, agroforestry etc.

Production is fragmented at microeconomic (small volume/farm) and spatial (plots of land and farms) levels. Yields are lower than with the previous model. The most ecological production methods (less artificialized industrially) are more unstable in terms of quantity, regularity and quality as they are more sensitive to climatic and sanitary vagaries. The capacities for capital investment are low and innovation is therefore more procedural and requires less industrial input (pesticides, fertilisers).

The supply to urban markets in ACP countries is becoming polarised because of the rise of mass distribution (Neven and Reardon, 2004). This kind of polarisation imposes logistical constraints (homogeneity, volume, regularity, etc.) similar to those in export markets. If the spatial concentration of demand leads to partial specialisation of producing areas, it has had little impact on microeconomic production specialisations up to now.

A compromise exists in the form of a dispersed spatial configuration, which generates marketing costs for market access. These costs prevent production systems based on family farming from taking advantage of the opportunities offered by the growth of local urban markets (Temple et al., 2009). Such marketing or transaction costs are found in the organisation of a product's journey from the fields throughout the whole transaction chain: road transport, handling and retailing[9]. Three main sets of variables guide investments in innovation.

Organisational variables of collective action in marketing

Innovations in collective actions that reduce marketing and transaction costs are linked to fragmented and dispersed production, which increases realisable value in favour of producers. These innovations can be implemented horizontally or vertically.

Vertical coordination happens through contracting with the food industry, which buys from different production areas. Such coordination tries to achieve more economy of scope than economy of scale.[10]

The emergence of horizontal coordination can take place through collective marketing action according to several possible options, such as the creation of cooperatives, which mutualise capital investment. In ACP countries, cooperatives have been historically manipulated by the state, and the non-specialisation of farms limits the structure of the cooperative sector. However, horizontal collective actions are developed through the mutualisation of services or investments: hiring means of transport, creating physical production markets, etc. Such collective coordination allows small-scale farmers to globalise their supply and meet the demands of the market without necessarily changing their production system. One axis of organisational innovation is to encourage the development of short distribution channels (a maximum of one intermediary between the producer and the consumer) through physical markets, but also through contractual supplies to institutional markets (school cafeterias, hospitals, etc.) or non-market channels.

Institutional variables for risk reduction

In small family businesses, unstable market access conditions and risk aversion are major determinants of investment capability for organisational or technological innovation, which would allow the implementation of inventions proposed by research or via tacit tests by farmers. In the case of horticultural products, this aversion explains social resistance towards the use of new varieties and practices which are more labour-intensive and risk rupturing collective territorial cohesion, or that are a potential threat to the systemic balance. Faced with several technological choices in such family farming contexts, horticultural producers maintain diversification of production systems, based on two dominant objectives. These are, namely, the selection of varieties that are resistant to disease constraints and the search for different culture systems that "break" the epidemiology of diseases. This systemic balance is institutionalised by the rules of social cohesion (community organisations, local authorities, lineages) and at different territorial levels (lowlands, valleys, plateaus, etc.) that govern the norms for collective acceptance of radical technological innovations. The choice of new varieties or intensifying the production function of inputs, capital or labour is linked to their consequences for such collective systemic balances and to the risks that they pose to these balances.

Structuring innovation systems: horticultural fragmentation

The previous determinant does not oppose innovations that intensify production inputs, but it does shape their complementarity with the systemic balance. It also decreases the risk of the production system depending too much on upstream phytosanitary industries or downstream food industries by focusing on the self-generation of productive resources.

However, in order to achieve the potential for increased production in such agriculture it is necessary to better organise supply chains for urban markets, which regionalise their supply systems in ACP countries. It requires the family farms that provide the bulk of horticultural production for these markets to speed up their adaptation to technology. It implies knowledge of how to adapt to downstream technological innovation in order to reduce logistics costs to market horticultural produce that is both fragmented and heterogeneous.

The two previous observations allow us to:

- Increase our knowledge about the potential for innovation in agro-ecological horticultural production systems among the various parties that shape sectorial innovation: horticultural producers, innovation intermediaries, researchers and businesses.
- Assess how enabling these possibilities reflects the social and environmental priorities that shape the cohesion of rural societies.

These issues move towards a systemic conception of innovation and break with the diffusionist linear model of conventional technological transfer: research=> business => users.

This break reinforces the features and mechanisms that complicate interactions between researchers, civil society and sectorial players in horticultural innovation. Such features are emerging in different contexts, but their visibility and social assessment in ACP countries remain fragile.

Conclusion

The distinction between endogenous and exogenous determinants of innovation processes in the horticultural sector of ACP countries illustrates two technological paths that, in ACP countries, coexist for the supply of markets in industrial countries and regional markets. The interactions between these two paths show different configurations depending on the territories: complementarity, competition and juxtaposition.

The first path is governed by changes in international standards and strategies for maximizing value through international firms seeking economies of scale and the integration of hidden social and environmental costs. It reinforces the vertical integration mechanisms of industries. The second path is more guided by the collective actions of family farms responding to the logistical constraints of supplying local markets and reducing the social and environmental threats to agrarian societies. Based on a more ecological agriculture, the activation of the innovation processes is dependent on guidance provided by innovation policies and research into a sectoral perspective. Such a typology is of course simplistic. Real situations are the result of the overlap of iterations and transitivity between these two sets of determinants. This typology provides an analytical framework which nevertheless allows us to examine the consequences of innovation processes on the development of ACP countries. These consequences can be assessed using the indicators of conventional economic analysis: creation of added value, distribution of added value (wages, tax revenue, etc.), salaried jobs and foreign exchange. They may also be categorized according to environmental, geographical and social externalities that are often negative: water pollution, population health issues (pesticides), reinforced social inequalities, higher population density and land evictions. These externalities reveal hidden social, environmental and political costs, which public policy makers and international donors need to be aware of in order to achieve sustainable development and steer innovation policy.

[3] Complementary relationships between different products or qualities that reduce fixed investment costs.

[4] Prospects for growth in regional horticultural markets (plantains, yams, fruits and vegetables) in ACP countries are important given the rapid growth of urban markets and consumption levels of these products that are below the

recommended standards.

[5] A mixed batch accelerates ripening, reduces the delivery time and increases losses. For long-distance shipping, sufficient volumes with an even level of ripeness have to be gathered.

[6] The creation of interprofessional organisations and of unions that shape national and even international policies by lobbying.

[7] The social and geographical concentration of this capital raises controversy about the impact on development that these strategies have.

[8] Relationship between an increase in business volumes and lower unit costs.

[9] Efficacy relationships between inputs and outputs that increase with the rate of technology adoption.

[10] One can distinguish between “established” markets (banana, avocado, pineapple, etc.), “emerging” markets (papaya, lychee) and “niche” markets (fair trade products) at the international level.

References

Dury, S., Medou, J.C., Foudjem Tita, D. and Nolte, C. 2004. Limites du système local d’approvisionnement alimentaire urbain en Afrique subsaharienne : le cas des féculents au Sud-Cameroun. Cahiers agriculture 13: 116-124.

Maertens, M. and Swinnen, J. 2009. Trade, standards and poverty: evidence from Senegal, *World Development* 37 (1): 161-178.

Neven, D. and Reardon, T. 2004. The rise of Kenyan supermarkets and the evolution of their horticulture product procurement systems. *Development Policy Review* 22 (6): 669–699. DOI: 10.1111/j.1467-7679.2004.00271.x

Tallontire, A., Opondo, M., Nelson, V. and Martin, A. 2011. Beyond the vertical? Using value chains and governance as a framework to analyse private standards initiatives in agri-food chains. *Agriculture and Human Values* 28: 427–441. DOI 10.1007/s10460-009-9237-2

Temple, L., Bertelet Ngassam and Nkamleu, G.B. 2009. Filières d'approvisionnement en ignames de Douala et changements technologiques. *Economies et sociétés. Série Systèmes agroalimentaires* (31): 1899-1912.

Temple, L., Kwa, M., Tetang, J. and Bikoï, A, 2011. Organizational determinant of technological innovation in food agriculture and impacts on sustainable development. *Agronomy for sustainable development* 31 (4): 745-755.

Temple, L., Flançon, F. and Montaigne, E. 2009. Concepts et méthodes en analyse de filières : application à l’agriculture, aux agro-industries et à l’espace rural. *Economies et Sociétés,* 43 (11): 1801-1933.

Wilson, J.S. and Otsuki, T. 2004. To spray or not to spray: pesticides, banana exports, and food safety. *Food Policy* 29: 131-146.

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