# Analysing productive processes and performances of agriculture at local scale in South Africa : How to proceed?

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# 3 *Analysing productive processes and performances of agriculture at local scale in South Africa: How to proceed?*

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Studying farming in South Africa, its transformations as well as its performances, can give rise to methodological challenges. Indeed, the vastness of the national territory and the range of bioclimatic conditions have led to the development of a variety of agricultural situations, making it difficult to 'cover' the current diversity by conducting research with reasonable human and financial resources. Furthermore, the combination of a social and political history marked by almost one century of racial discrimination and the planned destruction of black agriculture (Chapter 1), and economic changes at the beginning of the 1990s (state withdrawal, economic liberalisation, restructuring of downstream and upstream segments of value chains [see Chapter 13], and increasing integration into international markets), has shaped the significant contrasts between the different forms of production which characterise the agricultural sector. That is why most research on South African agriculture focuses on only one or several aspects of these changes or on certain forms of agricultural production, without grasping the bigger picture. This raises a number of questions: How should one proceed to remove these methodological constraints? What approaches and conceptual frameworks should be used? How might one analyse productive processes in agriculture, taking into account the social, political, economic and technical dimensions that have influenced, and continue to underlie, the sector in South Africa? How should one assess the technical and economic performance of the different forms of agricultural production in order to draw a comparative analysis? How should one resituate these productive processes in the wider dynamics of the agricultural sector, as well as people's rural livelihood?

This chapter presents a conceptual framework and methodological approach known as agrarian diagnosis in an attempt to answer these questions. The approach was developed at the French School of Comparative Agriculture in the Institut National Agronomique de Paris-Grignon (AgroParisTech), around the key concept of the agrarian system (Cochet 2012). Applied in many regions worldwide for several decades, this approach makes it possible to analyse productive processes in agriculture and assess performances of different forms of agricultural production at the local level (Barral et al. 2012; Cochet & Devienne 2006). Based on the results of the implementation of various agrarian diagnoses between 2009 and 2012 in several regions of South Africa (Cochet 2013), the application of the approach, presented

in this chapter, details original analyses of agricultural situations in the country (see Chapters 4 to 9).

The chapter starts by introducing concepts that are central to the approach and recalling their origin. It then describes the methodology of agrarian diagnosis, pointing out elements that came up when applying the methodology to the South African context.

## *Agrarian diagnosis: Origin of the approach and key concepts*

For a long time research has endeavoured to analyse agriculture around the world (Sourisseau et al. 2012). Farm diversity, which can be explained through the range of ecological, social, economic, political, historical and institutional situations in each agrarian society, has been conceptualised at several levels (plants, animals, plots, herds, farm, landscape, region and value chain), through different analytical prisms (technical functioning in agronomy or zootechnics, economic performances) and to various ends (response to sanitary or ecological issues, formulation of policy recommendations for agricultural development, modification of intervention methods in rural areas).

In the Anglo-Saxon academic world, research on farming has split into two categories (Cochet 2011, 2012). On the one hand, researchers adhering to the school of Farming Systems Research (FSR) began developing work in the 1970s focused on the study of technical processes in terms of farming systems, particularly on the scale of the farm unit. These works, generally conducted by agronomists or affiliates following various schools of 'technical' agricultural sciences, did not provide much scope for dynamics in the long run or for taking into account issues around access to resources, distribution of wealth among societies and its consequences, social relations, differentiation mechanisms, and conditions for integrating farmers into society as a whole. On the other hand, during the same period, researchers who were less concerned with explaining the systemic nature of production processes focused more on socio-historical approaches to the 'agrarian question', grouped together as 'Peasant Studies' or 'Agrarian Studies' (Bernstein & Bures 2001; Scott & Bhatt 2001). Conducted by researchers in the fields of (agrarian) political economy, sociology or history, these works emphasised aspects which had barely been tackled, if at all, within the framework of the FSR: social and historical dynamics; the economic and political contexts into which farmers' practices fitted; social relations linking farmers to society; the internal differentiation within rural societies; and even the role of market integration, as far as increased inequalities are concerned (Cochet 2012).[1]

In France in the 1970s and 1980s, researchers affiliated to the school of systemic modelisation of the functioning of farms, who were aiming to establish agricultural holdings' typologies (Cochet & Devienne 2006; Sourisseau et al. 2012), proposed analysing agrarian transformations differently. Focused on the specific concept of the agrarian system, agro-geographers and agro-economists adhering to the school

of comparative agriculture (Cochet 2011; Dufumier 2002; Mazoyer & Roudard 1997) endeavoured to reconcile the two categories of Anglo-Saxon academic approaches and to favour their cross-fertilisation: a systemic approach to document productive processes in agriculture on the one hand and, on the other, to analyse their long-term insertion into the social dimension of rural societies (Cochet 2012). These works relied in particular on the central concept of the agrarian system.

## *The agrarian system: A complex and multidimensional concept*

Although the concept of the agrarian system was already being used by many French geographers at the beginning of the 20th century (Cochet 2012), it was mainly French agronomists and agro-economists who, from the 1970s onwards, progressively took over the concept by reworking its definition. Particularly, Marcel Mazoyer defined the concept as 'a way of exploiting an agro-ecosystem that is historically defined and sustainable, adapted to the bioclimatic conditions of a given area, and responding to the social needs and conditions of the moment' (Mazoyer 1987: 11). It is a holistic concept that takes into account historical developments and the geographic traces of different forms of agriculture, and enables one to characterise major changes affecting production processes. According to Mazoyer (1987), an agrarian system encompasses the agro-ecosystem and its transformations over time; production tools, labour force and resulting artificialisation (i.e., anthropogenic impacts on the land); the social division of labour among farmers, artisans and industrial actors, and the subsequent agricultural surplus and its redistribution; exchange and trade relationships, ownership relationships and power relationships; and, finally, the ensemble of ideas and institutions that ensures social reproduction.

As such, this concept has taken on a complex definition resulting from the need to combine different analytical scales (plot, herd and farm, but also region and value chain) and, at the same time, to express all those relations linking the technical and social spheres, which must also take their dynamics into account. In this light, the agrarian system cannot be only considered as a technical system of practices of uses of natural resources, nor can it be reduced to the sole distribution structures of farmland. Rather, it envisages the technical changes and, at the same time, the modifications intervening in social relationships, not only at the local level but also at the national or even international level.

## *Cropping, livestock and production systems: Concepts leading to unavoidable embedding of analytical scales*

In order to account for the complexity of the agrarian system, it is useful to break it down into subsystems. The first subsystem corresponds to the basic agricultural production unit and refers to the agricultural holding. Indeed, the agricultural holding constitutes the basic stitch of the 'rural network', that is, the

basic organisation level of the productive processes where social and economic logics are embedded; where value chains become intermingled; where solidarities, contradictions and conflicts are formed (in particular relating to property rights); and where differentiation mechanisms are carried out. Often focused on family farms, as they are the main form of agricultural production found in many regions of the world, agricultural holdings can also take on other forms, such as corporate farms or agricultural enterprises.

The concept of 'production system' makes it possible to analyse production structures, practices and productive processes at the scale of the farm. Many authors look into this concept or its Anglo-Saxon equivalent (farming system) with a view to defining it (Brossier 1987; Pillot 1987). What appears as essential in this concept is that it sets out to study the combination of resources giving rise to a productive process: natural capital (location of farmland in the various areas of the ecosystem, which are exposed to specific bioclimatic conditions), human capital (importance, nature and education level of the workforce), physical capital (buildings, machinery, equipment, plantations and livestock herds, among others), financial capital (credit, investment capacity) and social capital (socio-professional networks).

However, rather than being applied on an individual basis for a given agricultural holding, the concept makes it possible to analyse a set of farms, in particular those which have the same kind of capital endowment, since they evolved into comparable socio-economic conditions and combine similar (crops and/or livestock) productions. As such, the concept of 'production system' describes a group of farms which, without being identical, present common features (Cochet & Devienne 2006), thereby leading to a modelisation into a conceptual representation that facilitates understanding of the origin, technical and economic functioning, and perspectives of evolution within the agrarian system.

The production system can in turn be divided into other subsystems, such as cropping systems and livestock systems, which are interlinked. The notion of a cropping system allows for the defining of a succession and/or an association of crops, as well as all the techniques applied to them according to a specific layout. The agronomic logic of the cropping system, closely linked to bioclimatic and socio-economic conditions (in particular the conditions of accessing resources), can be analysed systematically at the plot level. For example, the combined cultivation of maize, beans and butternut on the same plot at the same time can be considered a full-fledged cropping system if the same combination is repeated every year on the same plot. A succession of maize and then wheat (two production cycles on the same plot per year), which is allowed with pivoting irrigation during the dry season, for instance, will also constitute a cropping system. What happens at the level of the plot, what grows on it, the conditions under which cultivation takes place, the way in which cultivation is carried out, as well as the history of cropping on the plot, all make up a cropping system. At a comparable level of analysis, a livestock system is defined at the level of the herd or a portion thereof, and corresponds to

'a set of elements in dynamic interaction, organised by man with a view to developing resources through domestic animals, so as to obtain varied products (milk, meat, leather, hides, work, or manure), or with a view to meeting other production objectives' (Landais 1992: 83).

Except for the rather rare farms relying on only one cropping or livestock system, it is indeed the combination of different cropping and livestock systems that, once more, forms a production system at the level of the farm. Moreover, understanding logics of cropping and livestock systems often leads to analysing the production system at different levels, interrelating cropping systems at plot level and livestock systems at herd level (in terms of, for example, tool exchange, complementarity in the calendars of production, transfer of fertility).

## *The notions of livelihood or activity system: Are they complementary or contradictory to the production system?*

In many situations, family strategies go beyond productive processes in agriculture and are only understandable in the light of wider livelihood strategies. The logics underlying production systems cannot be understood without referring to 'a meta-system called activity system, which constitutes the real domain of coherence of farmers' practices and choices' (Paul et al. 1994). Some authors (Rieutort 2004; Sourisseau et al. 2012) highlight the fact that the concept of the agrarian system takes rural diversification into account insufficiently or in a difficult manner, for example, the development of off-farm (and often non-agricultural) activities, which can in some cases exceed (in terms of contribution to income and labour) the agricultural activity (see, for example, the literature review on the subject in developing countries carried out by Losch et al. 2012). Furthermore, given that the agrarian system is 'rooted' in a territory, it is difficult to include structural elements of contemporary rural societies such as the multi-situation of rural families in relation to the spatial mobility of family members engaging in off-farm activities (Ancey & Fréguin-Gresh 2014; Fréguin-Gresh et al., forthcoming). Finally, the concept does not make it possible to analyse conflicts/power plays around accessing and controlling resources by actors who are not engaged in agricultural activities, but who entertain urbanisation or nature conservation objectives, for example, which are also structural characteristics of the new ruralities.

These thoughts are akin to those of Paul et al. (1994) who, on finding that it was difficult for approaches focused on agriculture to account for family logics and strategies which are increasingly affected by the development of non-farm activities, chose to reason in terms of activity systems. The activity system is then part of a portfolio of activities. More recent works have endeavoured to adapt this approach by advocating a more integrated vision, and by taking more account of the non-market dimensions of the activity systems (Gaillard & Sourisseau 2009) in the tradition of thoughts on 'livelihood'-based approaches (Chambers & Conway 1991).

However, it is necessary to distinguish different kinds of pluri-activity: those that de facto concern the semi-proletarianisation of farmers or their generalised precariousness (survival or coping strategies), from those that lead to an increase in wealth and to the realisation of productive investments (Dufumier 2006), or the constitution/conservation of a heritage with a view to retirement or transmission to younger generations. In the first case, the development of pluri-activity is linked to the inadequacy of farm income, and the idea is to complement it with other sources so as to make ends meet. In the second case, pluri-activity is 'structural' (Losch et al. 2012) and the agricultural production system is only an element. However, even though it is structural, pluri-activity could not challenge the existence of a farm that, despite generating only a limited income, would not be in danger of disappearing.

Everything concerning the activity system or livelihoods which might help to explain the why and the how of the productive processes in agriculture (particularly its maintenance, when the conditions for its intrinsic profitability are no longer satisfied), ought to be examined very carefully. It is necessary to take into account these other activities in the study of the agrarian system, as well as to understand the links that exist between production systems and off-farm activities, whether or not these are situated near the farm (Cochet 2011). Appointing family labour to these different activities (depending on their duration and on the season, and in different places) can indeed be carried out in relation to the schedule of farm activities, and to the cost of opportunity allocated to specific days for working on the farm, in as much as external income opportunities can drive the farmer to modify his or her timetable accordingly (Ancey & Fréguin-Gresh 2014). This is where the concept of the activity system or that of the recently developed multi-sited family system (Fréguin-Gresh et al., forthcoming) takes its meaning from, as a combination of activities generating income, social security, social relationships and heritage.



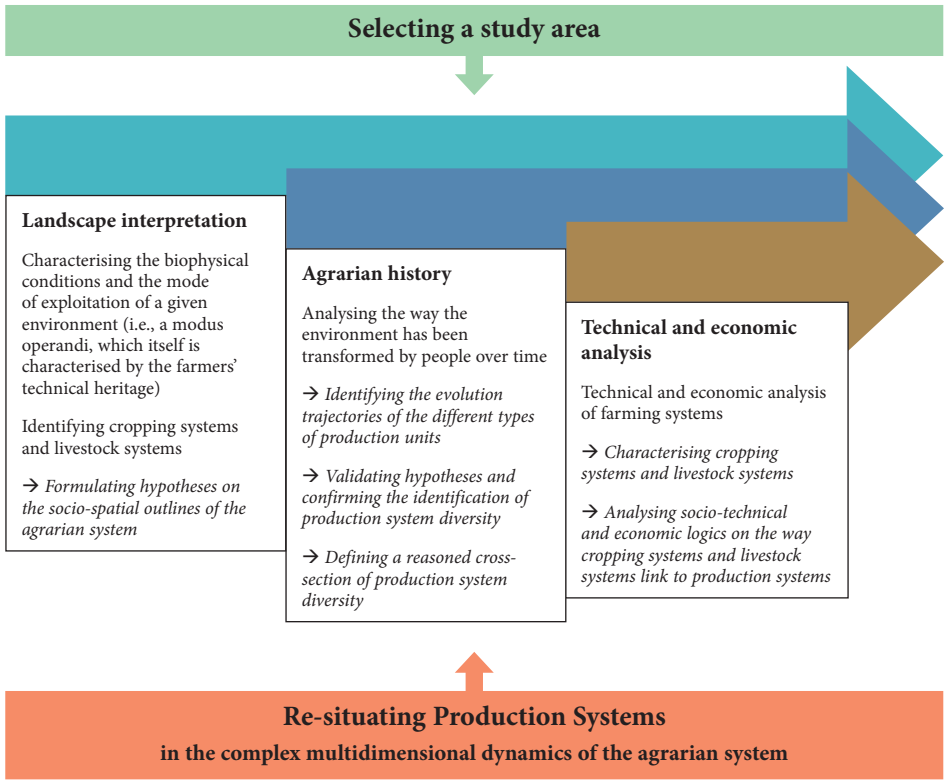
## *The agrarian diagnosis explained in light of its application in South Africa*

The agrarian diagnosis should be viewed as a reiterated procedure that can be broken down into several activities. Such activities do not correspond to separable steps of the work but, rather, are part of a constant back and forth analysis between concepts and fieldwork. The results obtained at the end of each activity sustain one another and make it possible to cover the different dimensions and complexity of the concept of the agrarian system. These activities are outlined in Figure 3.1.

### *Selecting a study area*

This step of the work concerns defining and delimiting a study area of limited size (a 'small-scale agricultural region') which is adapted to the application of the agrarian diagnosis, making it possible to formulate hypotheses on the socio-spatial dimensions of the agrarian system.[2] What must we understand by 'small-scale

*Figure 3.1 The agrarian diagnosis sequence*




Source: Authors

agricultural region'? First, the study area should cover a minimum spatial dimension that makes it possible to perceive the agrarian system as a whole. In other words, to 'cover the diversity' of production systems (even if it covers a much vaster spatial territory), it should embrace the relations between agricultural practices and the ecosystem, establishing one (or several) modus operandi or modes of exploitation of the environment, differentiation mechanisms within that system, and social relationships and rules relating to access and uses of natural resources, which should be consistent with the mode of exploitation of the environment. Understanding productive processes in agriculture at the small region level leads to in-depth analysis of the mechanisms at work (i.e., a combination of the characterisation of biophysical conditions and the farming practices, cropping systems and livestock systems which can be observed in the landscape, and signs of their past existence, among others).

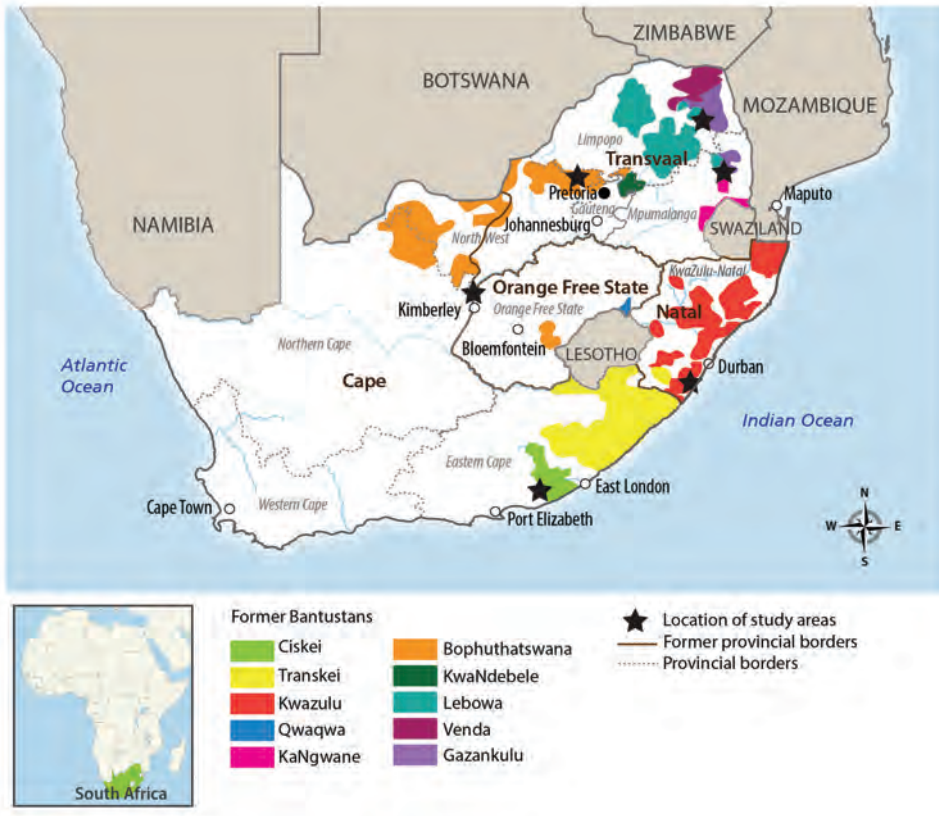
### *Studying historical dynamics and reconstructing production systems' trajectories*

The validation of hypotheses which are formulated when interpreting the landscape and identifying the diversity of production systems – as a result of the agrarian history and characteristics of the biophysical conditions of the study area – makes it possible to establish a sampling of farms covering the diversity of the production systems identified.

### *Analysing the production systems from a technical and economic perspective*

This analysis makes it possible to situate production systems in the multidimensional dynamic of the agrarian system, and its socio-economic and institutional sphere in particular (e.g. organisation and division of labour between the primary, secondary and tertiary sectors; insertion of farms into value chains and access to markets; the

*Figure 3.2 Location of areas selected to conduct agrarian diagnoses*




Source: South Africa: Overcoming Apartheid, Building Democracy website

social logics of farm operation and decision-making; exchange relations and balance of power, particularly as regards accessing and recognising property rights).

## *Selecting study areas*

The application of the framework in South Africa can be illustrated with six agrarian diagnoses realised between 2009 and 2012. The selected areas (see Figure 3.2) correspond to interface territories between former white-owned areas and former homelands where past development policies marked, and are still strongly influencing, agricultural dynamics. Selecting these areas can be put into the perspective of a common central problematics that would lead to an understanding of agriculture in South Africa, its evolution, performances and perspectives: the restructuring of agriculture led by post-apartheid transformations, in particular land and water management reforms, in the context of liberalisation and agrofood markets' restructuring. Even if each study area has a specific context (biophysical and socio-historical), as well as crop and livestock production systems adapted to or resulting from this context, local problematics is a good illustration of the general problematics (see Table 3.1).

*Table 3.1 Positioning of study areas in relation to the problematics*

| Study area | Biophysical conditions | | Agrarian reform | Water management reform | Agrofood market restructuring |
|---|---|---|---|---|---|
| Middle section of the catchment area of the Nwanedzi River (Limpopo) (Chapter 4) | Subtropical at medium altitude (450–1 000 m) | Soils formed on granite and Archean gneiss, from argillaceous to sandy | ++ | + (indirect) Great Letaba Water Users Association | Citrus and mango value chain oriented mainly towards exportation, liberalised, affected by the land reform and by the development of vertical integration by agribusiness-associating black producers |
| Agricultural region of Hazyview (Mpumalanga) (Chapter 5) | Subtropical at medium altitude (500–1 000 m) | Soils formed on dolerite (deep, slightly acidic, well drained and rich in organic matter and minerals), soils formed on colluvium (argillaceous, rich in organic matter) and soils formed on granite (sandy, shallow, acidic) | +++ | +++ White Waters Irrigation Board (Da Gama Dam); Sabie River Irrigation Board; area irrigated from Langspruit; irrigated perimeter of New Forest | Tropical fruit and macadamia nut value chains oriented mainly towards exportation, liberalised and affected by the development of vertical integration by agribusiness-associating black producers |

| Study area | Biophysical conditions | | Agrarian reform | Water management reform | Agrofood market restructuring |
|---|---|---|---|---|---|
| Kat River Valley (Eastern Cape) (Chapter 6) | Subtropical at medium altitude (450–650 m) | Soils formed on rock composed of sandstone and marl (not very thick or fertile), soils formed on alluvial deposits (alluvial terraces) | + | Perimeter irrigated on the alluvial terraces, no water user association | Citrus value chain oriented mainly towards exportation, liberalised, little affected by the land reform and by the development of vertical integration by agribusiness-associating black producers |
| Agricultural region of Sezela (KwaZulu-Natal) (Chapter 7) | Humid subtropical at low altitude (0–650 m) | Soils formed on granite (argilo-sandy, stony), soils formed on tillite (impermeable argillaceous sand to loam-sandy sand or subject to erosion), soils argillaceous-vertic derived from sandstone | +++ | No irrigation or water user association | Cane sugar value chain mainly liberalised, affected by the land reform and by the development of vertical integration by agribusiness-associating black producers |
| Riet River Valley (Northern Cape/Free State) (Chapter 8) | Semi-arid subtropical at altitude (1 100–1 800 m) | Argillaceous-loamy soils developed on alluvium, sandy soils developed on deposits of Kalahari sand, sandy soils, not very deep, on limestone rock | ++ | +++ Orange Riet Water User Association (Vanderkloof Dam) | Grain and livestock value chains affected by the privatisation of the GWK (Griekwaland-Wes Korporatief), former 'white' development agency and strategic partnerships, including land reform beneficiaries |
| Crocodile River Valley (North West) (Chapter 9) | Subtropical at altitude (1 000–1 500 m) | Soils formed on gabbro and norite, (melanic vertic clay, black, swelling) and soils formed on granite, sandy and shallow | +++ | +++ Hartbeespoort Dam Water Users Association (Hartbeespoort Dam) | Grain, oleaginous, cattle and vegetable value chains affected by the privatisation of the MGK (Magaliesberg Graan Koöperasie), the former 'white' development agency, strategic partnerships and vertical integration by agribusiness with land reform beneficiaries |

Note: + symbol refers to the level of implementation of the specific reform.
Source: Authors, according to the regional studies (Chapters 4–9)

### *Characteristics of the study areas and their local problematics*

The agricultural region of the middle section of the catchment area of the Nwanedzi River in Limpopo province (Chapter 4) is situated close to the town of Tzaneen, near the dam at the beginning of the catchment area of the Groot Letaba River, a tributary of the Olifants River, one of the country's most important rivers. The region straddles the former homeland of Gazankulu and a former white area. It has a subtropical climate at medium altitude and is characterised by variable agronomic-quality soils. Agriculture is characterised by food crops and cattle breeding (in the former homeland), as well as tropical fruit plantations (mangoes and avocado, in particular). A large part of the region is subject to land claims and certain farms have been redistributed; other programmes associated with the national affirmative action policy in agriculture are also at work in the region. Most industries, including the new industries linked to the application of the agrarian reform (industrial chicken), have been strongly reorganised after the liberalisation, and programmes have been linked to the application of the national affirmative action policy in agriculture.

The agricultural region of Hazyview in Mpumalanga (Chapter 5) is situated between the former homeland of KaNgwane and a former white area around the town of Hazyview. The region is wedged between the escarpment of the Drakensberg and the country's largest nature reserve, the Kruger National Park. It has a subtropical climate at medium altitude with a definite dry and cool season. The region is characterised by soils with potentially good agronomic quality and installations in irrigated perimeters (in the former white area). Agriculture is organised around vegetable cropping and cattle breeding (in the former homeland) or the production of tropical fruit and nuts (avocado pears, mangoes, citrus fruit, litchis and macadamia), industries which have been liberalised and reorganised since the 1990s. Since the implementation of the water management reform, rights have been allocated to black people and part of the former homeland has been incorporated into an irrigated perimeter. Most of the lands of the former white area are being claimed by black people and one property has already been returned through an agrarian reform programme.

The downstream section of the Kat River Valley in the Eastern Cape (Chapter 6) is situated between the western extremity of the former homeland of Ciskei and a former white area around the town of Fort Beaufort. The climate is subtropical at medium altitude with a definite dry and cool season. Generally, the soils have a mediocre agronomic quality, except for those on the alluvial terraces of the Kat River. Different agricultural productions are set up according to their location in the valley: vegetable or food crops in the upper section (in the former homeland), and cattle breeding, goat keeping and sheep farming, as well as citrus fruit plantations, on the terraces of the former white area. Although only few lands in the former white area have been claimed in the region, tensions are high as far as resources are concerned, particularly at the level of the alluvial terraces, where certain farms have been redistributed and are under a mentorship programme. The latter involves citrus

export agribusinesses, which represent their only way to access the industry which has been strongly reorganised since its liberalisation.

The agricultural region of Sezela in KwaZulu-Natal (Chapter 7) is situated 80 km from one of the country's most important cities, Durban. It includes the two former missions of Ifafa and Mtwalume (in the black reserves), and a former white-owned area around the small town of Sezela and its sugar refinery. The climate is humid, subtropical at low altitude, with soils characterised by a variable agronomic potential. Agriculture is organised around the sugar cane and eucalyptus plantations (depending on the altitude) in the former white-owned area, and around small sugar cane plots and staple food crops, as well as cattle rearing and goat keeping, in the former mission areas. Several land reform programmes have been implemented. Former missions have been returned to black trusts, and lands acquired by the state through the LRAD programme and the PLAS have been redistributed to set up new black planters. Land transactions outside the official framework to benefit black people have also been taking place and have been carried out by the local sugar company, which anticipated the claims.

The upper section of the Riet River Valley, a tributary of the Orange River, straddles the Free State and Northern Cape provinces (Chapter 8), and is not far from the city of Kimberley, well known for its diamond-mining and -processing operations, one of the most important in South Africa. Soils in the irrigated perimeter around the township of Jacobsdal are not very developed and cannot be cultivated without irrigation, owing to the semi-arid climate. Agriculture is organised around the production of forage (alfalfa), pecan trees, vines and temperate cereal crops, as well as cattle, buffalo and antelope rearing, and sheep keeping. This region, unlike the others, does not include former homeland areas. However, it is currently affected by the water management reform and the widening of the irrigated perimeter to include new black users within the framework of land reform programmes (SLAG, LRAD and PLAS). The presence of a former 'white' agricultural development agency, reorganised and privatised, has had a strong impact on value chains and conditions for accessing markets.

The upstream section of the Crocodile River Valley, downstream from the Hartbeespoort Dam, in the North West province (Chapter 9) is made up of a formerly white corridor – the irrigated valley – in the middle of the formerly scattered homeland of Bophuthatswana, north of Brits, a town situated about 60 km from the country's political capital, Pretoria. The region has a subtropical mountain climate with a definite dry and cool season. It is characterised by variable to excellent agronomic-quality soils, depending on the location. Residents produce mainly vegetable crops and forage at the level of the irrigated perimeter (in the former white-owned area), as well as sunflowers and cattle rearing (in the former homeland). Almost all the lands of the irrigated perimeter, previously reserved for white people, are claimed by the Bakwena Ba Mogopa community, and some have been returned. The reform of the legislation on water management has been

implemented and has given some black people access to water. Moreover, various programmes linked to the application of the national affirmative action policy in the domain of agriculture (AgriBEE) are being applied, and have compelled the former agricultural development agency, which was reorganised and privatised, to intervene in the form of strategic partnership programmes for the beneficiaries of these reforms. This has contributed to the transformation of the value chains and conditions for accessing markets.

## *Defining and delimiting the study area*

Defining and delimiting a study area is central to the agrarian diagnosis. As such, the definition and delimitation of the area to be studied has major consequences on the diagnosis: omitting a cultivated land, a grazing area, a forest or an exploited lagoon or, on the contrary, including areas to which the micro-society being studied does not have rights poses a problem when harmonising the different and interdependent components of the system.

In South Africa, defining and delimiting a 'small' farming agricultural area with a view to studying it and applying an agrarian diagnosis can be a difficult task, for several reasons. On the one hand, the first people who exploited the environment were hunter-gatherers and nomadic herders who used vast pastures with poor vegetation. As such, there was no initial clearing per se, nor any separation of one communal territory from another, with the possibility that different population groups could have met and shared territories without usage or property rights being properly defined. In fact, it is this difficulty which is at the centre of certain land conflicts in South Africa; conflicts that require evidence of what would be the limits or outlines of the agricultural territories of certain populations, who claim lands within the framework of land reform programmes.

On the other hand, the distinctive history of apartheid and its indelible traces in the landscapes of South Africa make the selection of a small agricultural area all the more delicate. In many regions of the world, it often happens that a given micro-society first establishes the definition of the area being studied on the basis of cleared and cultivated lands, then grazing areas and, finally, other exploited areas, such as forests, swamps and lagoons. The selected area then shows relative homogeneity from the point of view of its occupation, planning and mode or exploitation of the environment. However, in South Africa, the landscape is most often marked by the juxtaposition of several highly contrasted units, for example irrigated perimeters next to rain-fed grazing lands and cropping areas with no apparent link, with landscape and human units resulting most often from apartheid policies implemented at the time. Yet, these units remained embedded and interwoven by links and flows of labour, people, goods, experience and innovations, among others. This is the case of the populations of Marite and Hazyview, Alice and Fort Beaufort, Bethanie and Brits, and Nwa'Mitwa and Tzaneen. While these townships bring together groups of black

populations which could be considered different (in terms of ethnicity and modes of exploitation of the environment) from the towns created by the whites, these two worlds have always maintained, including during apartheid, strong interlinks (the black workforce was indispensable to white farming; the agricultural production of white people was indispensable to the survival of black people). Therefore, it is essential to incorporate them into the same agrarian system. This amounts to saying that the equation 'agrarian system = specific homogeneous micro-society' cannot be solved. In this sense, in South Africa it is inconceivable to choose and define a study area by 'artificialisation', that is, the mode of exploitation of the environment, which is the relevant starting point of an analysis in terms of agrarian systems in many regions of the world. In South Africa, hypothesising that two distinct 'agrarian systems' exist on each side of these major landscape discontinuities (between white-owned area and black-owned area) would amount to perpetuating apartheid ideology in the methodological approach. By denying the multiple interrelations between these two spaces, such a hypothesis would not make it possible to understand how the differentiation of each one of these two spaces can only be understood in reference to the other, to the detriment of a systemic and holistic understanding of the system. The methodological choice made within the framework of agrarian diagnosis, which is also one of the originalities of the approach applied in South Africa, is actually the primacy of the complexity of the social sphere through the prism of interrelations, de facto linking micro-societies that were artificially separated by past policies, but that never stopped maintaining relations and flows, as a result making them non-disconnected.

Finally, the meaning taken on by 'small' area is debatable when farms have surface areas of several thousands of hectares, as is the case with the Kat River Valley where farms can reach 13 000 ha, or in regions where surface areas are not as vast but remain just as significant (i.e., with over 1 000 ha in the Brits irrigated scheme). This is also the case in the former homelands where concentrations of populations in the townships are such that, even if the spaces allocated to them are insufficient in relation to the demographics, farming dimensions in *small* areas are large, especially when they include communal grazing areas. As such, it is difficult to delimit a territory that has a reasonable size when conducting detailed surveys and that, in addition, must cover the diversity of existing situations, when farming occupies large surface areas that would require working with very large study areas.

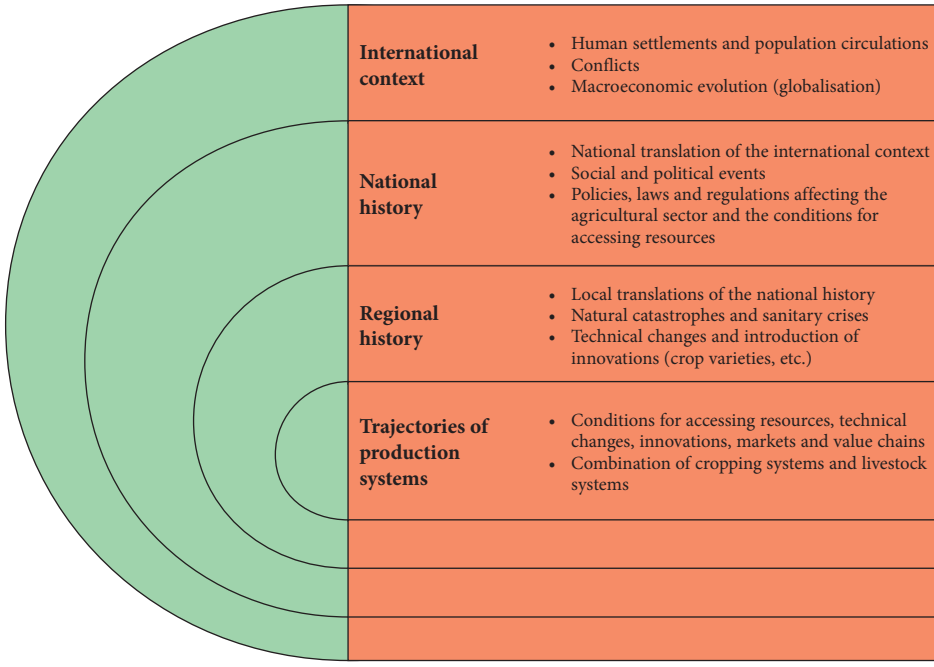
## *Characterising the mode of exploitation of the environment*

Once the study area has been defined and delimited, the idea is to characterise the mode of exploitation of the environment in its historical dynamic at several levels. To this end, it is necessary to examine the landscape with the aim of organising the space of the study area into different parts, according to 'what can be seen as regards uses and practices, at a given time … of the agro-ecosystem [of each one of the exploited spaces of the study area], and as regards the potential relations between

[them]'. This activity makes it possible 'to gather visual and factual elements on [agricultural] practices, and to formulate a number of interpretative hypotheses as much on the functioning of the landscape and the systems that forged it, as on the most recent modifications to which it was subjected and which are still perceptible' (Cochet & Devienne 2006: 580). However, an *examination* of the landscape could not alone lead to the analysis of the agrarian system. The mode of exploitation of the environment is not set and its dynamic is governed by the rhythm of national and regional history, which finds expression at the level of the study area, in production system trajectories that transform, adapt, change, create themselves or disappear, depending on their structure and specific operations (see Figure 3.3). These trajectories lead to a 'differentiation [of production systems which] is the product of that history' (Cochet & Devienne 2006: 580).

It is important to differentiate elements falling within the competence of the international context, national history and regional history from factors of production system differentiation. Indeed, agrarian history results from the combination of these different scales of analysis. In South Africa, for example, the international context authorised European colonisations after the 17th century, which are the

*Figure 3.3 Multi-level agrarian history to analyse the origin and evolution of production system trajectories*




Source: Authors

cause of serious population conflicts, displacements and reorganisation of peoples and, as a result, property and usage rights in natural resources are being called into question. They are also behind the fact that cultivated plants, non-indigenous domestic animals and agricultural practices were introduced into the country. The national history, and that of the 20th century in particular which is linked to the successive political regimes (including apartheid), has deeply modified property rights and the ways of accessing resources (including land and water), and has created extremely favourable conditions for the development of certain exclusive agricultural structures. Regional histories, which vary greatly according to contexts, in addition to being local reflections of international and national events, are also governed by the rhythms of significant local changes (e.g. sanitation; the introduction of a plant, a technique or a value chain; the development of a town; the creation of a local industry or the establishment of an irrigated scheme). In the end, it is the combination of these scales that, depending on the production system structures and operations that actually satisfy intrinsic and dynamic characteristics, leads to local productive processes being reconstituted.

## *Selecting production units to be studied in detail and sampling*

Once the mode of exploitation of the environment has been characterised and the prior identification of the production systems – the result of multi-level history – established, it then becomes possible to characterise the technical operation of the systems and assess their economic results. To this end, it is of course important to determine a sampling of operations from which to collect the necessary data.

The agrarian diagnosis is a qualitative approach (see Box 3.1). For this reason, it is not meant to spatially cover an administrative entity or a given population – which would be senseless from the point of view of the concept of the agrarian system – or to offer results statistically representative at a specific scale. Nevertheless, by characterising the established and identified diversity of the production systems of a given study area, the agrarian diagnosis makes it possible to illustrate the trends and dynamics of the local agriculture, with enough subtlety and precision to learn reliable lessons on the probable perspectives of agricultural development. It does not prevent one from quantifying the results obtained in the end (estimation of technical and economic performances, including farm incomes) and can be combined with quick surveys, making it possible to 'weigh' each type of production system within the studied area.

**Box 3.1 A question of terminology: Qualitative, quantitative, representative, illustrative and quantified**

In the Social Sciences, quantitative or hypothetico-deductive approaches are used to conduct research on populations from statistical samplings, by using a random technique involving a choice to be made by those being interviewed 'randomly' from an exhaustive list of peoples, or involving 'quotas' relying on the constitution of a sample representative of the population, according to sociologically pertinent criteria (e.g. gender, age, geographical location).

Qualitative approaches, on the other hand, are used to conduct research works aiming at detecting or analysing trends, relationships and so on within social processes (descriptive observations and argument analyses). Instead of being guided by hypotheses that require testing (statistically) in order to verify the theory, they are guided by questions: these can be inductive (the primacy of the field results makes it possible to work out a theory) or rely on going back and forth between field and theory (i.e. grounded theory). As such, qualitative approaches do not mobilise closed-ended questionnaires to collect data (which are the central instrument of quantitative approaches). They mobilise other tools adapted to their objectives (e.g. life stories, open-ended and semi-directive interviews, simultaneous and participant observations), which are applied in the field based on a judgement sample, making it possible to apprehend the diversity of situations and favour the comparison of the processes being studied.[3] Of note is the fact that qualitative approaches do benefit from results backed up by figures.[4] Indeed, the strength of these methods relies on the rigour of the research position and the care with which data were collected, data that must be detailed in order to offer a reliable illustration of the reality to be studied.

A 'snowball' sampling is then carried out so as to search for farms that are illustrative of the different trajectories and production systems previously identified. For each type, a small number of production units is then selected and will give rise to as many detailed case studies. As such, in each area studied within the framework of this book, between forty and sixty production units have been studied in detail from a technical, as well as economic, point of view.

## *Characterising the technical operation and measuring the economic efficiency of the production systems*

It then becomes necessary, for each selected production unit, to collect information that will make it possible to carefully characterise the technical operation of the production system and the potential integration of the productive activity into a diversified activity system, and also to measure the economic efficiency of the agricultural production processes. This characterisation phase must be based on observations and interviews carried out by immersing oneself totally in the study area. This is a *sine qua non* condition of the approach that compels the interviewer to also be the researcher and not to delegate the collection of information required for the analyses. Indeed, observing (the environment, practices, living conditions, etc.), questioning and listening, going constantly back and forth between the collection and analysis of data and the hypotheses built around the key concepts of agrarian

diagnosis, involve long phases of immersion in the study area (at least five months concerning the regional studies presented in this publication). If the researcher must also be the interviewer, it is also because the selection of producers to interview is built systematically, on the basis of an examination of the landscape and a historical approach to the productive processes.

As such, this phase leads to the assessment of the technical performances and the economic efficiency of the production systems, for which three economic orders have been focused on: value added, which is an expression of the creation of wealth resulting from the system operation; productivity, which measures the efficiency of the production factors (in labour and land in particular); and farm income, understood as resulting from the value-added distribution process.

### *Value added and productivity*

The net value-added criterion measures the wealth creation of the agricultural production system. It is equal to the difference between the value produced (the gross profit) and the value of the goods and services consumed in whole or in part during the production process. In order to make an accurate calculation of the production system operation, gross profit and intermediate consumptions can be evaluated directly by the cropping system or livestock system based on yields, product prices and crop management sequence or herd management pattern over time,[5] therefore, from the technical operation of the production system.[6] As to the depreciation of fixed capital assets (or amortisation), this is evaluated on the basis of the actual duration of the utilisation of long-term goods and services, a duration which is considered as a characteristic of the production system (Cochet & Devienne 2006).

The significance of the notion of value added is to allow the comparison, among production units, of the economic results obtained, irrespective of the methods used in distributing this value added among the actors who contributed to its creation. Whether the production unit is family-based (the result of its operation ending up as farm income) or an agribusiness (where profit rate is privileged), whether value added remains largely in the hands of the producer if she or he is the owner of the capital and works with the family workforce, or whether it is distributed among the farmer, the landowner, the banks and the salaried workers, or, on the contrary, concentrated in the hands of the capital contributor, value added remains the universal criterion that makes the comparison of the economic performance of the different forms of agriculture, as found today in South Africa, possible.

Value added can then be brought down to the quantity of production factors involved in the productive process. As such, productivity indicates a relationship between value added (the difference between the value of goods produced and that of goods consumed during the production cycle) and the quantity of production factors used in producing them – the land, capital and labour in particular. One

speaks of capital efficiency to indicate the ratio of value added to the total quantity of (fixed and working) capital being mobilised, of land productivity to indicate value added produced per hectare, and of labour productivity to indicate the ratio of value added to the quantity of work used (measured in hours or in working days or, still, in number of workers).

In order to measure the economic performance of farms, assess their efficiency and compare this performance from one group of farms to another and from one region to the other, these two ways of spelling out productivity – i.e., labour productivity and land productivity – are essential. While the latter (annual value added brought down to the total surface of the production unit) is an expression of the result of productive process intensification, the former (annual value added brought down to the quantity of work) measures the efficiency of the work incorporated into the productive process.

### *Distribution of value added and farm income*

The definition adopted for farm income corresponds to the portion of the net value added which is kept by the producer, once the distribution operations of value added have been carried out. This distribution reflects the conditions of access to resources mobilised in the production process (land rent paid to the owner, salaries paid to non-family labour, interest on the capital borrowed, land and product taxes). Potential subsidies can complement the portion of value added which is to be paid to the producer, thereby increasing his or her income. An aspect of farm income which is particularly important to families, whose production is partly for their own consumption, is that it is calculated by integrating the whole of the farm consumption representing a part of the value produced by the production unit. This income is therefore distinct from cash income, although both results are frequently confused in the specialised literature.

While value added and productivity measure the economic efficiency of the production system, as a process of value creation, it is farm income which is in a position to express what enables producers to support their families and, if possible, to invest with a view to increasing their capital and, in the end, the productivity of their farms. In family farming, it is this criterion that will best inform the future of the farm, its capacity for development and the conditions of access to resources, as determined by the socio-economic and institutional contexts into which farms are inserted, largely conditioning the way value added is going to be shared out and, therefore, the producer's income. In farm business, profitability is what will be more sought after, in other words, the ability of the business to give a return on invested capital. Profitability can be measured thanks to the internal rate of return. Insofar as the social and economic logics at work in family farms and other social forms of production (businesses in particular) are not the same type, farm income and return on invested capital are not comparable as such. Yet, in South Africa, the juxtaposition

of very different production units and the questions raised on their future reinforce the importance and necessity of making such comparisons. That is why the criteria of value added and factor productivity, which govern value-added distribution and therefore the remuneration of work and return on capital (criteria that make it possible to measure job creation and income generation), are particularly interesting with a view to comparing social forms of production that are so different.

## *Placing production systems in the socio-economic and institutional sphere of the agrarian system*

Probably one of most difficult activities to be carried out in the agrarian diagnosis, alongside that of defining the study area and its outlines, is placing production systems in their socio-economic and institutional sphere. Indeed, as noted, the concept of the agrarian system proposes placing production systems, which are characterised by a structure as well as a social and economic logic leading to specific practices and performances, in a complex, multidimensional dynamic.

On the one hand, it is necessary to study certain elements of natural resource governance within the micro-society which the agrarian diagnosis proposes to study. Human societies have always organised themselves with a view to acquiring and using resources to satisfy their needs for survival and reproduction, through agriculture, in particular, as well as mining activities. By appropriating and using resources (including land, water and trees) which vary according to region, availability and techniques and practices to exploit them, each society has created institutions to regulate their access, usage and control: property rights, which are often sanctioned by the national legal system, constitute the best example of this. The agrarian diagnosis must of necessity lead to an in-depth understanding of property rights and, more generally, of resource access, usage or extraction; regulation or management; as well as exclusion and alienation methods which are usually the product of history. In this sense, agrarian history, related in particular to land distribution and reorganisation in South Africa, is most illustrative in cases where indigenous people who had property rights, acquired through the ancient appropriation of resources of given territories, were deprived of these rights, which they are currently claiming or which have recently been restored to them.

Moreover, the agrarian diagnosis should also shed light on the interweaving of social logics as well as productive logics linked to agriculture, particularly because they are at the centre of the family farming operation as a special form of production. Farming family logics are not simply the results of a combination of production factors. The work of such families is not just agricultural and located in one place only. Indeed, certain family members are hired in other economic sectors and it is necessary to understand the social organisation and division of family labour between the primary sector (on or outside the farm in the case of mining activities, or the sale of workforce as farm labourers), secondary sector (industry and factories

set up in rural areas) and tertiary sector. It is, therefore, necessary to study the existing costs of workforce opportunity. However, family logics, to be understood at both the individual and collective levels, often follow several objectives (of production, occupation, heritage, etc.), combining several production ratios which are not wage ratios (unlike the logics of other forms of agricultural production, as in the case of farming businesses). An understanding of the agrarian system would be incomplete without taking into account these structuring elements that go beyond technical or economic issues: organisation and division of labour between the primary, secondary and tertiary sectors; insertion of farms into industries and access to markets; the social logics of farm operation and decision-making; exchange relations and balance of power, particularly as regards accessing and recognising rights on resources.

Finally, understanding the integration and interrelations of production systems in an agrarian system entails exploring issues of access to markets and integration into industries, downstream as much as upstream. These elements, which can be partially understood in the study of agrarian history, determine the existing balance of power within the micro-society, and will have an influence on the future of farms. In South Africa, the facts that a significant number of farms (in the hands of non-white people) were excluded from markets for almost one century, and that white farmers were subsidised, led to important gaps in productivity and income which cannot be compensated for at present, whether through social welfare implemented after the end of apartheid, the transfer of capital from other non-agricultural sources of income, or the recent impulses enabled by the current national policy of affirmative action. To consider the perspectives of development of production systems, it is indispensable to understand these issues beyond internal operational logics.

### *Notes*

1 Peasant Studies only rarely called upon the concept of 'system', because the technical process as such was seldom the focus of analysis. Moreover, there was a certain distrust vis-à-vis the approach in terms of systems. Indeed, searching for the system's characteristics, its 'balance', its 'internal coherence', the 'retroactions' and 'regulations' inherent to the notion of system, its 'reproducibility' seemed, in the eyes of these researchers, incompatible with the highlighting of internal conflicts, tensions and differentiations. Researchers engaged in Peasant Studies or Agrarian Studies, as well as those adhering to the school of FSR, did not give enough attention to the social relations of production and exchange, to the study of crisis and reconstitution periods and therefore to historical dynamics (Cochet 2012).

2 The delimitation of the outlines of a study area cannot be a priori defined, because it depends closely on the combination of biophysical conditions – i.e., the potentialities and vulnerabilities of the natural environment – and the method used to farm the environment, which offers the first hypotheses for pinpointing and explaining the diversity of encountered agricultural productions.

3 Open-ended interviews are a data collection technique in which the researcher intervenes very little. She or he indicates a general theme which the respondents interviewed choose to explore as they like. Open-ended interviews are used during agrarian diagnosis, particularly to gather information on the study area that adds to the 'examination' of the landscape and the main components of the agrarian history. With the technique of semi-directive interviews, the researcher prepares an interview schedule adapted to the survey and to the theme being tackled (with a view to studying technical practices or assessing sales, for example). However, during the interview, the researcher does not necessarily follow the order in which the questions were planned; questions should fit into the discursive thread of the interviewee, who is free to structure his or her own thoughts. The researcher can, depending on the discourse of the interviewee, end up asking questions that were not planned and/or end up not asking questions that were planned initially.

4 In this sense, these interviews differ from ethnographic surveys.

5 Gross profit: The value of final productions, including sales estimated at the selling price for each type of production system according to their insertion into the food-processing industry, and farm consumption estimated at the market price.

6 Intermediate consumptions: Annual consumption of goods or services.

### *References*

Ancey V & Fréguin-Gresh S (2014) Les familles, le travail et l'exploitation agricole. In JM Sourisseau (ed.) *Agricultures familiales et mondes à venir*. Versailles: Editions Quae

Barral S, Touzard I, Ferraton N, Rasse-Mercat E & Pillot D (2012) *Assessing smallholder farming: Diagnostic analysis of family-based agricultural systems in a small region*. Los Baños: Southeast Asian Regional Center for Graduate Study and Research in Agriculture

Bernstein H & Bures TJ (2001) From peasant studies to agrarian change. *Journal of Agrarian Change* 1(1): 1–56

Brossier J (1987) Système et système de production, note sur les concepts. *Cahier Sciences Humaines* 23(3–4): 377–390

Chambers R & Conway G (1991) *Sustainable rural livelihoods: Practical concepts for the 21st century*. London: Institute of Development Studies

Cochet H (2011) *L'Agriculture comparée*. Paris: Editions Quae

Cochet H (2012) The 'systeme agraire' concept in francophone peasant studies. *Geoforum* 43(1): 128–136

Cochet H (2013) *La question agraire en Afrique du Sud: échec d'une réforme*. Accessed 18 July 2015, http://www.afd.fr/webdav/shared/PUBLICATIONS/RECHERCHE/Scientifiques/Focales/17-Focales.pdf

Cochet H & Devienne S (2006) Fonctionnement et performances économiques des systèmes de production agricole: Une démarche à l'échelle régionale. *Cahiers Agricultures* 15(6): 578–583

Dufumier M (2002) *Un agronome dans son siècle, actualités de René Dumont*. Paris: Karthala

Dufumier M (2006) Diversité des exploitations agricoles et pluriactivité des agriculteurs dans le tiers monde. *Cahiers Agricultures* 15(6): 584–588

Fréguin-Gresh S, Cortes G, Trousselle A, Sourisseau J-M and Guétat-Bernard H (forthcoming) Le système familial multi-localisé : Proposition analytique et méthodologique pour interroger les liens entre migrations et développement rural au sud. *Mondes en Développement*

Gaillard C & Sourisseau J-M (2009) Système de culture, système d'activité(s) et rural livelihood: Enseignements issus d'une étude sur l'agriculture kanak (Nouvelle-Calédonie). *Journal de la Société des Océanistes* 129(2): 279–294

Landais E (1992) Principes de modélisation des systèmes d'élevage. *Les Cahiers de la Recherche Développement* 32(2): 82–95

Losch B, Fréguin-Gresh S & White E (2012) *Structural transformation and rural change revisited: Challenges for late developing countries in a globalising world*. Accessed 24 July 2015, http://www.afd.fr/webdav/site/afd/shared/PUBLICATIONS/RECHERCHE/Scientifiques/Co-editions/Structural_Transformation_RuralChange_Revisited.pdf

Mazoyer M (1987) *Dynamique des systèmes agraires*. Colloque sur la dynamique des systèmes agraires. Paris: Ministère de la Recherche et de la Technologie

Mazoyer M & Roudard L (1997) Pourquoi une théorie des systèmes agraires? *Cahiers Agricultures* 6(6): 591–595

Paul J-L, Bory A, Bellande A, Gargant E & Fabri A (1994) Quel système de référence pour la prise en compte de la rationalité de l'agriculteur: Du système de production agricole au système d'activité. *Les Cahiers de la Recherche Développement* 39: 7–19

Pillot D (1987) *Recherche développement et farming system research, concepts, approches et méthodes*. Document de travail, 40. Paris: Ministère de la Coopération, Réseau Recherche-Développement

Rieutort L (2004) *Système agraire*. Accessed 24 July 2015, http://translate.google.co.za/translate?hl=en&sl=fr&u=http://www.hypergeo.eu/&prev=search

Scott JC & Bhatt N (eds) (2001) *Agrarian studies: Synthetic work at the cutting edge*. New Haven, CT/London: Yale University Press

Sourisseau J-M, Bosc P-M, Fréguin-Gresh S, Bélières J-F, Bonnal P, Le Coq J-F, Anseeuw W & Dury S (2012) Les modèles familiaux de production agricole en question: Comprendre leur diversité et leur fonctionnement. *Autrepart* 62: 159–181