Using Agrarian System Analysis to Understand Agriculture

The regional study of agrarian systems provides a methodology for understanding the diversity and the complexity of agricultural practices. It provides a research and planning tool that allows us to understand each form of agriculture and to roughly establish the characteristics of the historical transformations and geographical differentiations of a rural society. This helps when defining appropriate policies, strategies, programmes and projects that are related to poverty or resource management.

An agrarian system can be defined as the way farmers exploit the environment by using the relations and interactions that occur between all of its social and physical components. The system also takes into account the limits of the environment and its ability to reproduce.
The agrarian systems approach takes a historic perspective by taking into account the spatial and temporal limits of an agrarian system. It tries to understand the organisation, the operation, the renewal and the differentiation of the past. This in turn helps provide a better understanding of the complexity of the present dynamics, the socio-economic structures and the mode of exploitation of the ecosystem.

The mode of exploitation consists of the farm work, the inert production means (equipment, tools, etc.) and the living production means (crop seeds, reproductive animals, etc.) that perpetuate a cultivated environment. It is a social product, the result of the relations between different actors whose objectives can be identical, complementary, and/or contradictory.

An agrarian system is composed of three main elements (Figure 1):

**Methodological approach**

The methodology of the agrarian systems survey is based on:

- Analysis of agro-ecological, technical, social and economic elements and their interactions. Agriculture is a complex combination of diverse parameters.
- The study of a limited number of different situations. The diversity and complexity of agricultural situations can be surveyed by a limited number of well-chosen case studies.
- Looking at different scales, from the international level down to the plot levels. Like climate, local agricultural situations can be seen as the product of a general situation and local particularities. The agrarian systems survey is conducted from a general to a local scale.
- Studying the evolution of farming systems at different times. Agriculture is changing and appropriate interventions cannot be proposed without understanding the trends that already exist.
- Using simple tools such as landscape observations and discussions with farmers. Agricultural landscapes and farmers’ knowledge are the best and largest source of organised information.
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- Using an iterative approach. Information from observations or interviews is cross-checked and verified so hypotheses can be tested and adapted.

How to analyse and diagnose agrarian systems

To understand the mode of exploitation of a particular ecological region by communities with similar rules, it is necessary to understand the methods the communities use in each part of ecosystem. Exploitation at farm level cannot be understood without knowing the mode of exploitation of each parcel and herd composing the farm.

Analysis and diagnosis of complex agrarian systems is conducted at three different levels:

At regional level: identifying a limited number of homogenous zones.

An administrative region like a district or a province can present a great diversity of agricultural situations. To avoid making a single proposal for intervention in the whole region, or to avoid making too many proposals that could be difficult to implement, it is necessary to identify a limited number of zones with different agricultural situations, and to understand the main characteristics of their evolution.

At this broad scale, it is important to understand the main ecological and socio-economic characteristics and the main associated modes of natural resource exploitation. Available ecological and socio-economic data, such as

<table>
<thead>
<tr>
<th>Level of organisation</th>
<th>Concept of system associated</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Region or zone level</td>
<td>Agrarian system</td>
<td>An agrarian system can also be defined by a particular combination of different farming systems in similar socio-economic and agro-ecological conditions.</td>
</tr>
<tr>
<td>Farm level</td>
<td>Farming system</td>
<td>A farming system can be defined by a particular combination of farm available means of production to conduct different cropping and animal raising systems to reach farmers objectives. e.g.: farms using hired labour force, tractors, 1 ha of irrigated fields and 2 ha of other fields to produce rice soyabean and vegetables.</td>
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<tr>
<td>Plot level</td>
<td>Cropping system</td>
<td>A cropping (or herd) system can be defined by the different fields (or herds) managed in the same way (techniques, tools and other inputs). e.g.: rice fields with associated crops, cultivated with handtools on slash-and-burn forest fallow.</td>
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<tr>
<td>Herd level</td>
<td>Animal husbandry system</td>
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topographic, geological, soil or vegetation maps, climatic data, survey data, various statistics, population density, and main infrastructure can be very useful in making a hypothesis to explain agricultural differences.

Fieldwork is also necessary to observe the agricultural landscapes along transects and to identify the different agro-ecological and socio-economic conditions (see Figure 3). Important factors that explain agricultural differences are: landscape types (plateaux, valleys, plains), vegetation types (forests, savannah, wetlands), main infrastructure (roads, irrigation schemes, markets), types of agricultural land (fields, fallows, grasslands), and main weeds, pests, crops and animals. This information forms the basis for a hypothesis about the links between the different factors and agricultural practices.

Interviews with experienced farmers, usually older individuals, can provide a great deal of information about the past and present agricultural situation and begin to provide an understanding of the reasons for change, such as landscape transformations, technical adaptations or socio-economic trends.

A homogenous zone is defined as a sub-region where similar transformations on similar ecological and socio-economic conditions have led to a similar situation. At a regional scale, the survey of agrarian systems leads to a zoning map that shows a limited number of different homogenous zones.
At zone level: understanding the organisation and the functioning of the agro-ecosystems and identifying the diversity of farming systems.

A homogenous zone does not mean that all parts of the agro-ecosystems are the same or are used in the same way by farmers. It is essential to define and characterise the different parts of agro-ecosystems (forests on the hills, fields in flooded lowlands, grasslands on slopes etc.), the farmer’s uses of these areas (e.g. slash-and-burn rice cultivation in forest, paddy rice and fish culture on flooded land or cattle raising on grassland) and the rules attached to these different areas (such as private property, or community management with prevalence of the first user). These elements are important in themselves, but the links between them are often more relevant. Once again observations and open discussions with experienced farmers are often the main source of information.

The Nakai Plateau zone

Except on its mountainous border, the Nakai plateau zone in Khammouane Province is characterised by lowlands and small hills. The plateau can be divided into four agro-ecosystem units:

- On a marginal area far away from the river, farmers have invested in developing wet season paddy fields. This area can sometimes be flooded and part of the production lost, depending on the duration of the flood.
- Forest fallow and slash-and-burn rice cultivation occupy the numerous non-flooded small hills and the largest cultivated surface.
- Other fallow and slash-and-burn rice cultivation fields are located on the lowest land, but only short cycle varieties are cultivated to avoid losing the entire production to floods.
- Grasslands occupy the rest of the lowlands. They are ‘maintained’ by annual or biannual fires to feed more than 4,000 buffalo.

Source: IRAM, 2004
Farming systems in northern Phongsaly district

There are many types of farming in northern Phongsaly but three are particularly interesting when compared:

- Type 1: farming systems of rice fields cultivated on forest slash-and-burn long fallow, with maize and opium cultivation, buffalo herding, family labour force and handtools.
- Type 2: the same as type 1, except that rice is cultivated on savannah with draught animals.
- Type 3: the same as type 2, except that rice is cultivated in lowland rainfed paddy fields.

Farmers themselves say that farming system 3 is better than type 2, which is better than type 1. Analysis of each system shows that this is not because of the supposed superiority of paddy cultivation.

In this zone, paddy rice gives about the same gross added value per worker as the other rice fields, but the fact that no work is needed in the paddy fields during the poppy cultivation season seems to be the real reason why farmers prefer farming system 3. Indeed, whereas the forest has to be slashed at the same time as opium is being collected, and the savannah fields have to be ploughed during poppy weeding, type 3 farmers can use their entire labour force for the operations that usually limit the acreage of poppy fields. They can, thus, double the surface cultivated and produce about twice the quantity of opium otherwise produced!

Source: Baudran 2000
It is also important, at this stage, to categorise the farmers who exploit the different parts of the agro-ecosystems. This diversity can be surveyed by considering a limited number of farmer types, who carry out similar activities with similar means of production and a similar evolution.

At this scale, for each zone, the agrarian systems survey leads to a better understanding of the organisation and functioning of the different areas composing the agro-ecosystem. It also leads to a typology of farming practices by different farmers.

**At farm level: understanding the coherence of each farming system and identifying their problems.**

Understanding the utilisation modes of the different parts of the agro-ecosystem unit and identifying the different categories of farmers is only the first step.

It is then necessary to analyse in detail the organisation, the functioning, the performance and the evolution of the farming systems implemented by these farmers. This can be defined as a combination, within the farm, of productive activities (plant or animal production, agro-processing), and means of production (land, tools and equipment, labour force, capital, etc.) in time and space.

Once more, the range of farming systems can be surveyed by analysing a limited but diversified number of situations. The sample should be chosen in order to have several farms from each category as case studies. It is not a random sample, as often used to avoid bias, but it will ensure that less representative farming systems, i.e. those that may be adapted to future conditions, will be interviewed.

Semi-structured interviews with each farmer, and/or his wife, should be conducted and should gather the following information:

- A census of the available production means (land, tools and equipment, herds, labour force, capital, etc.) which, by detailing their characteristics, quantity, value and uses, provides information about farm resources. This gives a basis for understanding the farmer’s choices.

- The family and farm history, which indicate the settlement of the farm, the production means currently available, the inherited goods, the purchases, the credit that could have enriched the farm, the evolution of the labour force, the technical and activity changes and so forth. This data can be used to identify the issues involved in the farming system transformation and the major trends (diversification, specialisation, capitalisation, impoverishment, etc).

- A detailed analysis of each sub-system composing the actual farming system, by detailing the cropping systems, the animal husbandry systems and the processing systems. At the plot or at the herd level, it is important to understand the different operations and techniques in relation to the agro-ecological conditions (e.g. soil fertility and structure, weeds and pests, water and light), plus the tools and labour force required.

- A detailed analysis of relationships between sub-systems and especially between livestock and crops: competition, like the use of the same land or the same labour force at the same moment, or complementarities, like the use of crop residues as cattle feed, manure production
and transfer of fertility, animal workforce for ploughing, etc.

- An economic appraisal of each cropping system, each animal husbandry system and the whole farm by calculating: Average Added Value as a measure of the whole wealth produced; agricultural income as a measure of the farming system profitability; added value per worker or per hour as a measure of labour productivity; added value per hectare as a measure of land productivity, and so on. The agricultural income will be matched and discussed with the needs of the family.

At the farm level, the survey and interviews lead to an understanding of each farming system and a comprehensive identification of the problems and constraints faced by farmers. Following this, the frequency of occurrence of each farmer and farming system category can be calculated.

Agrarian system survey tries to understand how and why rural communities exploit the natural resources of their agro-ecosystems by agricultural practices.

Such a survey should then provide policy, programme and project designers with zones of different agricultural situations and trends, and a clear understanding of the main factors affecting farmers’ choices. Taking these different agricultural developments into account, project designers can then propose public interventions adapted to each zone in order to improve the farm environment.

**Selected references**

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**Authors**

Silinthone Sacklokham (silinthone20@hotmail.com) and Emmanuel Baudran (cclparis@club-internet.fr)

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