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FOR THE SUSTAINABLE FOODSYSTEMS OF
TOMORROW**

**WAW proposed methodological framework to monitor
agricultural structural transformations and their
contributions to sustainable development**



Observatoire des Agricultures du Monde
*Comprendre les évolutions structurelles des agricultures
Alimenter le dialogue politique*

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Abstract:

Informed decisions on 'agricultural transformation', the rapidly changing diversity of agricultural holdings, could play a decisive role in society's response to several global challenges, including food security and environmental sustainability. Improved stakeholder access to information on the social, economic and environmental impacts of transformations and likely future trends is a key requirement for promoting evidence-based decision making in related policy formulation and planning. The World Agricultural Watch (WAW) has recently been proposed as a platform for continuous global monitoring of agricultural transformation. This paper presents its methodological framework - i.e. an integrated set of monitoring activities and associated methods which would provide key information that stakeholders could use to influence future outcomes of transformations.

Based on the premise that different types of agricultural holding contribute in significantly dissimilar ways to societal goals, the framework proposes an approach using indicators for (a) developing an internationally-comparable typology of agricultural holdings, and (b) assessing the short-term outcomes on food security and environmental sustainability of different types of holdings, while taking into account influencing factors at larger territorial scales. When developed, the typology will accommodate further detailing to meet specific sub national needs in various farming-system settings throughout the world. It would also be useful in guiding future statistical data collection for which distinction among holding types is important. Preliminary results from on-going research on the development of a typology for the cotton zone of Mali are presented.

Keywords: agricultural transformation, farming system, territory, farm typologies, indicators

1. INTRODUCTION

Different agricultural holdings can have dissimilar social and economic impacts and contribute in dissimilar ways to societal challenges (e.g. food security, poverty alleviation, climate change, scarcity of natural resources, loss of biodiversity, sustainable rural development). As illustrated in the example below, small scale farming is generally labor intensive and offers more employment opportunities compared to large-scale, highly mechanized farming, which is, however, often characterized by higher productivities per active laborer.

Small scale farms

- Labor intensive
- Poor access to credit
- Low incomes (not remunerated)
- High productivity per hectare
- Poor, food insecure, marginalized
- Absence of other employment
- Low market integration

Large-scale agro-industrial estates

- High mechanization
 - Capital intensive
 - Large volumes (economies of scale)
 - Mono-cropping (specialization)
 - High productivity per active laborer
 - High market integration; Competitive on regional to global markets
-

It is widely acknowledged that many regions of the world are undergoing fundamental ('structural') changes in the diversity of agricultural holdings. Major drivers of these changes include: specialization of production to achieve economies of scale; lifestyle preferences; high cost of technological improvements; large-scale land acquisition; demand for certified products; land consolidation; international environmental agreements; global trade and free trade agreements and national 'historical' dependencies.

Despite the relevance of ongoing transformations to many societal challenges, there is so far no systematic international effort to monitor the phenomenon and provide objective evidence to guide related policy formulation and planning, not only at local to national levels, but also at intergovernmental and global levels. There is presently insufficient knowledge about the driving factors, scope and consequences of transformations to determine what the structures of agriculture will be like for the next generation of farmers and to what degree these structures will meet the multiple expectations of society. Better knowledge of transformations is needed so that national and international stakeholders together may be in a better position to influence future outcomes. The World Agriculture Watch (WAW) was initiated in response to this need. WAW will provide a global platform for facilitating the acquisition and sharing of locally relevant and internationally-comparable data and information, in support of more evidence-based decision making on issues which influence agricultural transformation. This paper presents an overview of the WAW methodological approach.

2. WHAT TO MONITOR - THE OPERATIONAL SCOPE FOR WAW

Agricultural production may be characterized on the basis of several distinguishing criteria (e.g. holding size, tenure, use of hired labor, agricultural practices, reliance on non-farm activities, source of financing, and degree of market integration). Changes in these distinguishing criteria reflect farmers' choice of production strategies to improve their livelihoods in response to continuously evolving priorities, opportunities and constraints. Based on the current state of their five capital assets (natural, physical, financial, human, social) and taking into consideration the socio-economic context (e.g. policies, information), farmers evaluate risks and choose one or more production options along with associated

management or technological choices (e.g. intensive crop production with some hired labor supplemented by some off-farm work). A decision is subsequently taken on how the output of production should be allocated (e.g. as savings, home consumption or sales). The future outcome of this allocation is that the 5 capitals either increase or decrease, which in turn influence a new cycle of future decisions (FAO and World Bank, 2001). A progressive and consistent long-term shift in the choice of production option (e.g. toward increasing reliance on labor or other inputs) gives rise to the phenomenon of transformation.

WAW has adapted the sustainable livelihoods framework (DFID, 1999) for guiding the scope of monitoring. This analytical framework allows a structured, comprehensive understanding of transformation, including driving forces and impacts. Figure 1 shows that in response to off-site drivers and on-site pressures, the managers of different types of agricultural holdings employ different strategies to allocate their five key capital assets - through appropriate tradeoffs - in order to achieve desirable short-term outcomes (economic, social or environmental), which over time influence conditions at wider ‘territorial’ scales. Management strategies of holdings are in turn strongly conditioned by environmental, economic and social conditions at territorial level.

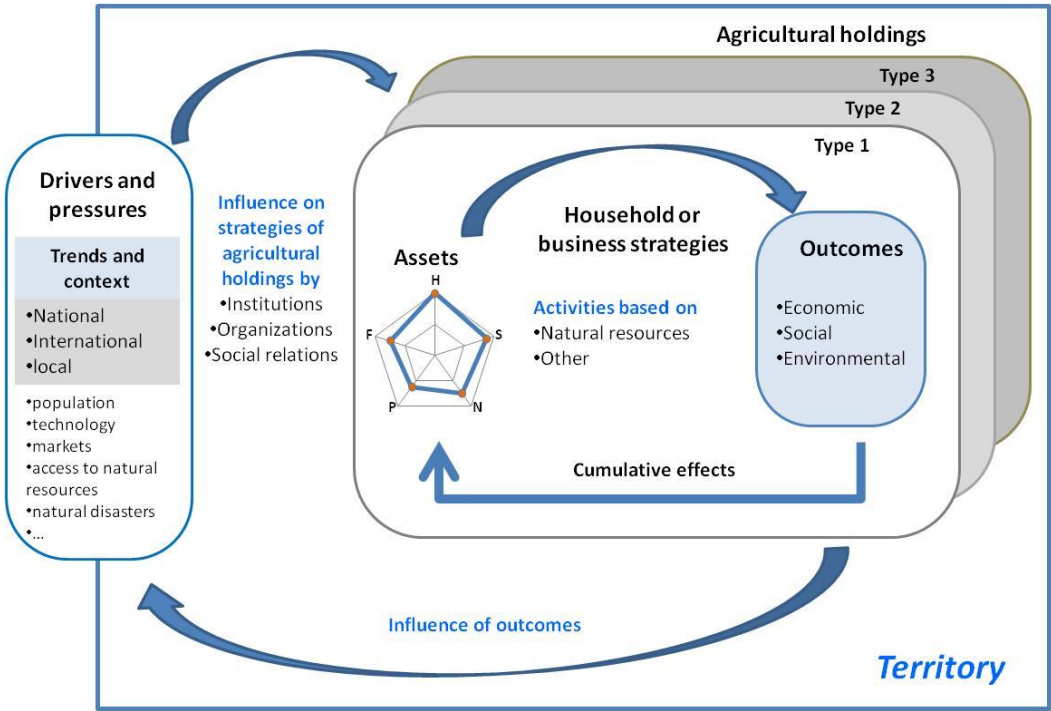


Figure 1: WAW adaptation of the Sustainable Livelihoods framework

3. KEY LEVELS OF OBSERVATION

3.1. AGRICULTURAL HOLDING

Management of activities at a detailed integrated level within a given farming system is carried out by the agricultural holding, defined as “.....an economic unit of agricultural production under single management comprising all livestock kept and all land used wholly or partly for agricultural production purposes, without regard to title, legal form, or size. Single management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative or government agency. The holding's land may consist of one or more parcels,

located in one or more separate areas or in one or more territorial or administrative divisions, providing the parcels share the same production means, such as labor, farm buildings, machinery or draught animals” (FAO, 2005). The holding therefore represents a key unit of observation for WAW monitoring of transformations since management practices and strategies involving changes in structural characteristics are determined at this level.

A wide diversity of agricultural holdings exists due to the variety of conditions determining the major farming systems (e.g. resources base, land use, socio-economy, management inputs, market orientation, and non-farm income). However, there is no internationally accepted typology of holdings which would facilitate compilation of reliable statistics and allow international comparisons. Yet such comparisons are necessary to guide policy formulation and planning, not only within countries, but also at international levels. Access to statistics disaggregated by holding type would, for example, allow stakeholders to evaluate the relative importance of different types to various policy objectives (*e.g. employment, food security, environmental sustainability*) and to lobby for appropriate changes (e.g. to access resources, inputs, credit, technology, knowledge and markets) to create the necessary enabling environment.

A typology of holdings to meet local and international needs

Differences in holdings are referred to using a variety of imprecise terms (e.g. smallholder, peasant farm, family farm, small scale producer, etc.). WAW will develop an internationally comparable typology of agricultural holdings based on a ‘core’ set of indicators spanning the 5 capital assets. Table 2 presents a preliminary set of Core WAW indicators, all of which are among the set of indicators recommended for the World Program for the Census of Agriculture 2010 (FAO, 2005) or are collected regularly in many countries as part of the national agricultural census or periodic surveys. The typology to be developed by WAW will build on the approach currently under review by CIRAD which uses hired labor as a key distinguishing criterion to create three types of holdings: (i) Holdings with essentially family labor (ii) Holdings with family and permanent hired labor (iii) Holdings with exclusively hired labor.

Additional indicators to those shown in Table 2 are foreseen to cover issues such as off-farm activities, migrations and market integration (e.g. involvement in aggregation of farm produce, transportation, storage, processing, packaging, wholesaling, retailing – through various linkages)(FAO, 2007). The WAW approach of first developing a typology followed by categorization (i.e. labeling) according to differing user needs avoids shortcomings of ‘a priori’ labeling as a basis for subsequent data collection (e.g. a ‘small’ farm in Brazilian or North American may differ in many respects from a ‘small’ farm in West Africa).

In addition to the ‘core’ set of internationally-comparable indicators, ‘supplementary’ indicators may be added to reflect national needs for more detailed distinctions among holding types. **Figure 2** illustrates differences in capital assets among three distinct holdings based on a locally relevant typology for the cotton zone of Mali (CIRAD, 2012). The capital assets used to characterize holdings were: (1) **Human** (size of the family; gender of head of holding; level of education); (2) **Social** (family workers; permanent hired; affiliation to rural producers’ organizations; off-farm activity); (3) **Natural**: total area cultivated; Land use (% type of crops); Land tenure (4) **Physical**: agricultural equipment; livestock owned (5) **Financial**: access to credit; amount of credit; value of livestock.

The main characteristics of the resulting three distinct holding types are:

- **Type 1:** small, very few land assets, animals and access to financial capital;
- **Type 2:** small, few land assets and social capital (organization, external labor, etc.); oriented toward cattle production on ‘commons’ pasture areas.
- **Type 3:** significant land assets; use of external labor

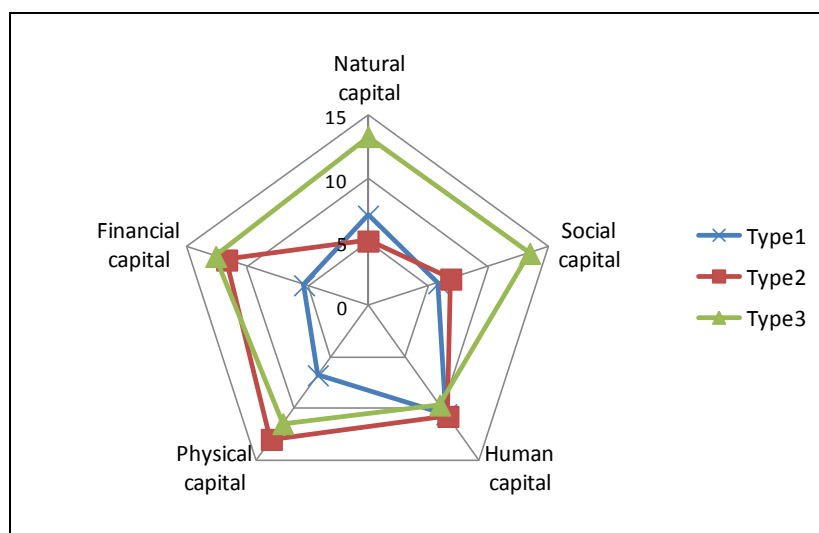


Figure 2: Allocation of capital assets for 3 distinct types of agricultural holdings in the cotton zone, Mali (CIRAD, 2012).

Owing to their relevance in formulating recommendations to address constraints and opportunities associated with specific holding types, the typologies to be developed by WAW will necessarily take into account the level of market integration (or value addition) by holding types (e.g. access to market, type of transaction) and the constraints that they face (in terms of market and institutional development). This would help in explaining both the current structure of holdings as well as likely transformations under different scenarios of constraints. Newly emerging forms of holdings (e.g. temporary ‘pool de siembra’ leasing of a set of smaller holdings to achieve economies of scale for short-term profits) will necessarily need to be taken into account, where locally relevant.

3.2. CONTEXTUAL OBSERVATIONS AT TERRITORIAL LEVEL

The WAW adaptation of the sustainable livelihoods framework is applied not only at holding level but also at larger ‘territorial’ scales. Territories will be flexibly defined by local stakeholders considering among others (i) the level of aggregation of available statistics – given WAW’s plan to make the most of existing statistical data (ii) administrative districts and/or geographic zones of social and historical significance that are relevant from a policy formulation or decentralized planning perspective, and (iii) the related monitoring effort (e.g. spatial coverage, detail, repeat frequency, costs) which would be required.

The rationale for monitoring at territorial scale is that management decisions for any given agricultural holding are also influenced by its geographic (or ecosystem) context, including off-site effects from neighboring holdings (i.e. externalities). Secondly, policy and planning actions which influence transformations usually target large policy-relevant regions (e.g. major farming systems or administrative units). Understanding the context of management

decisions at holding level is facilitated by analyses of territorial-level indicators, such as those proposed in Table 1.

4. WAW PRINCIPLES OF MONITORING

WAW’s goal is to contribute to the improvement of the livelihoods of the rural agricultural population by enhancing stakeholder access to up to date information on transformations in order to foster more evidence-based decision making on related issues. However, transformation is a complex phenomenon involving a wide diversity of holdings, differing drivers and potential consequences of different management strategies in different local contexts. Accordingly, a sufficiently ‘holistic’ multi-sectoral framework for continuous monitoring is required to meet effectively WAW’s goal. The fundamental, desirable elements of such an approach – summarized below as WAW principles of monitoring -- are used to guide selection of specific methods at various stages of WAW implementation.

1. *The aim of monitoring is to provide objective policy relevant information on agricultural transformation without being prescriptive.*
2. *The monitoring of transformation and associated impacts should be coherent at multiple hierarchical levels of planning and decision making– local to global levels – meeting local needs while facilitating international comparisons.*
3. *WAW monitoring should be stakeholder centered, participatory, and gender sensitive.*
4. *Monitoring of transformation includes analyses of past tendencies and future trends (space and time), and should be carried out on a periodic basis.*
5. *WAW monitoring should build on key relevant existing initiatives to assure sustainability*

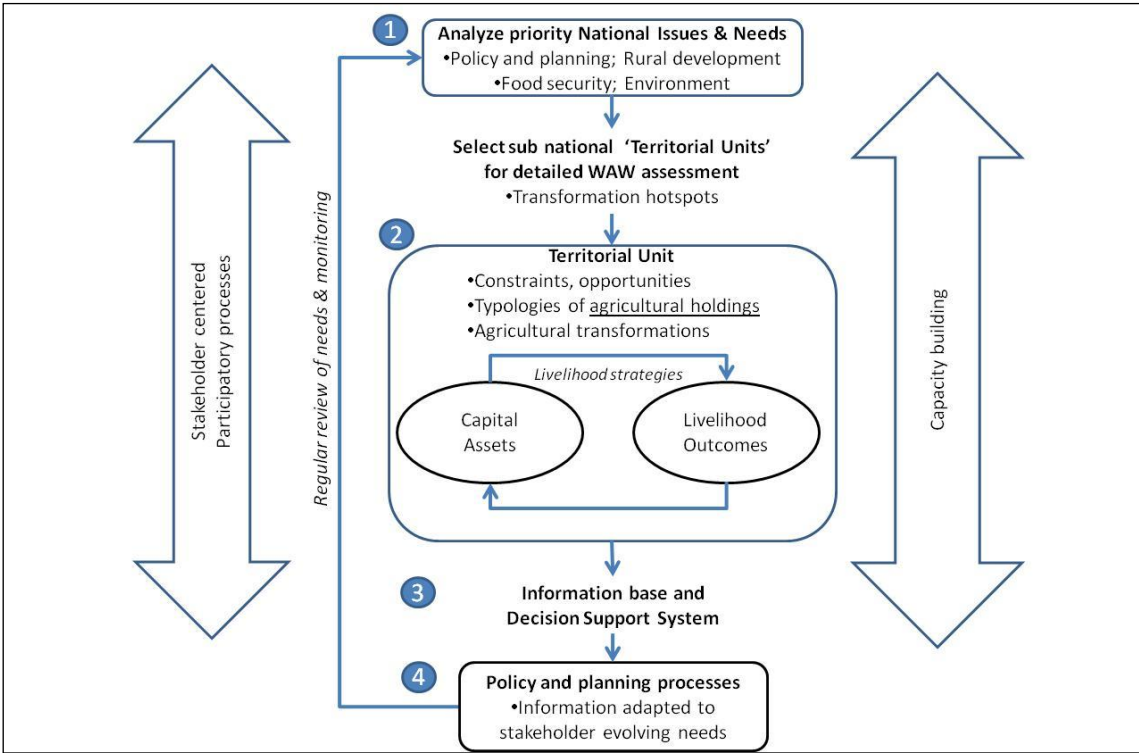


Figure 3: Overview of the 4 major steps of the WAW methodological framework.

5. GLOBAL OVERVIEW ANALYSES – WHERE TO FOCUS ATTENTION?

WAW will monitor areas exhibiting different rates of transformation. Several existing global datasets, although generally of coarse spatial resolution would be useful for selecting broad geographic regions (covering one or more countries) for detailed WAW monitoring. Data on population growth would be invaluable in analyzing relatively ‘slow’ transformations in some regions (e.g. parts of Africa where agricultural transformation is driven primarily by demographic pressure and domestic investments). In other regions of fairly rapid transformation, a wider range of global dataset could prove useful, for example (i) agricultural statistics (e.g. from the World Census of Agriculture) (ii) land-use and land cover changes derived from remote sensing imagery (iii) household surveys (iv) SOLAW systems at risk (FAO 2011a) (iv) inventory of large-scale land acquisitions.

6. MAJOR STEPS IN WAW MONITORING: NATIONAL LEVEL

Once a country is selected, WAW monitoring within the country will proceed according to the four major steps illustrated in Figure 3. Depending on the size of a country, Steps 1 and 2 may proceed concurrently. An indicative list of WAW’s methods, related activities and main outputs at each step appears below.

Indicative list of WAW’s Methods – National level

Step 1: Analyze priority national issues and trends and select sub-national territorial units for detailed WAW assessment and diagnostic

(i) Review of documentation / data (ii) Territorial diagnostics (5 capitals; DPSIR framework) (iii) Trend analyzes (statistics, remote sensing, etc.)

Outputs -- Report (e.g. transformations and farming systems; drivers, trends); database

Step 2 -- Detailed 'territorial' assessment

(i) Participative workshops (e.g. stakeholder participation in monitoring / validation) ; (ii) Spatial analyses (e.g. land-use systems mapping); (iii) Statistical analyses (cluster, principal components; scoring) –for determining holding typology / outcomes (iv) Modeling; DPSIR (e.g. Forecasting transformations; strategies); (v) Field surveys (New data collection)

Outputs: Report on a typology of agricultural holdings; holding outcomes; spatial database

Step 3 -- Information base and decision support system

(i) Participative methods of empowerment of stakeholders at multiple levels (local, national and international) (ii) Information system design (focused on user needs)

Outputs -- information base; enhanced stakeholder capacities

Step 4 -- Policy and planning processes

(i) Workshops : Training, Awareness building, Future options (ii) Information synthesis

Outputs -- Policy briefs ; enhanced capacities

6.1. STEP1: DIAGNOSTIC STUDIES --- NATIONAL LEVEL

A this step, national stakeholders will define priority issues, constraints and opportunities linked to agricultural transformations and select ‘territories’ where detailed WAW analyses will be carried out to better inform on these issues. Both the policy context as well as other data and information on land use and management from a variety of knowledge sources (e.g. scientific, indigenous, extension services) need to be considered in selecting territories.

Policies which have significant impacts on transformation include those on food trade, export, inputs, credit, technical assistance, access and management of resources. Other relevant information to consider, if available, are agro-ecological zones, production systems,

land cover change; agricultural statistics; administrative boundaries; investments in agriculture, land degradation; and socio-economy (e.g. poverty, population characteristics, infrastructure,...). In some countries, for example, a declining farming population due to aging and lack of interest in farming by younger generations will pose major constraints to future agricultural production - a fact which needs to be taken into account in formulating policy options for influencing future transformations.

6.2. STEP 2: DIAGNOSTIC STUDIES WITHIN SELECTED TERRITORIES

Analyses in Step 2 will complement, as necessary, the results from the national diagnostic study already undertaken in Step 1. To the extent feasible, WAW will use data from existing surveys (e.g. *national agricultural census; food security surveys, poverty surveys, LSMS-ISA*) for its indicators. Special-purpose data collection will be necessary in cases where the required data are missing. In all cases where new data collection is considered, efforts will be made to select as far as possible variables which have been recommended in the Global Strategy for improving agricultural and rural statistics (World Bank, 2011). The diagnostic study at this level will review main issues, opportunities and priorities and include the following analyses.

Characterization of territories

A set of ‘territorial level’ structural indicators will be used to assess changes and associated drivers, as well as examine the contributing role of markets and institutions to observed changes (Table 1). Owing to issues of scalability, the indicators at territorial scale are not simple aggregates of those chosen for the more detailed holding level described in Step 3.

Locally important typology

Based on selected indicators, stakeholders will identify a locally important typology of agricultural holdings, while keeping in mind the need to assure international comparisons (See 3.1 Agricultural holding). Maps, graphics (e.g. radar diagrams), and statistics (e.g. spatial extent, number of holdings, etc. disaggregated by holding type, gender, poverty) will be prepared. Such disaggregated statistics will facilitate, among others, better targeting of policies to meet specific needs of different types of holdings.

Short-term outcomes of holding strategies and management practices

Outcomes refer to results obtained in the short term (e.g. less than 5 years) from the management of holdings which over time bring about changes in the capital assets of the holding. WAW will focus on indicator analyses of outcomes associated with (i) Food and nutrition security (Table 3), and (ii) Sustainable management of the resource base – as reflected in selected social, economic and environmental conditions (Table 4). The list of indicators shown in Table 4 would be further developed (building on existing specialized guidelines such as those for assessing land degradation at national level -- FAO, 2011b) in order to capture information on specific agricultural management practices used at holding level. Modifications in current practices would be key in promoting changes in outcomes. Main sources of existing data for analyzing short-term outcomes will be agricultural and household surveys. These surveys use different units of observation (holding versus household). WAW will develop practical, case-specific solutions for linking these datasets.

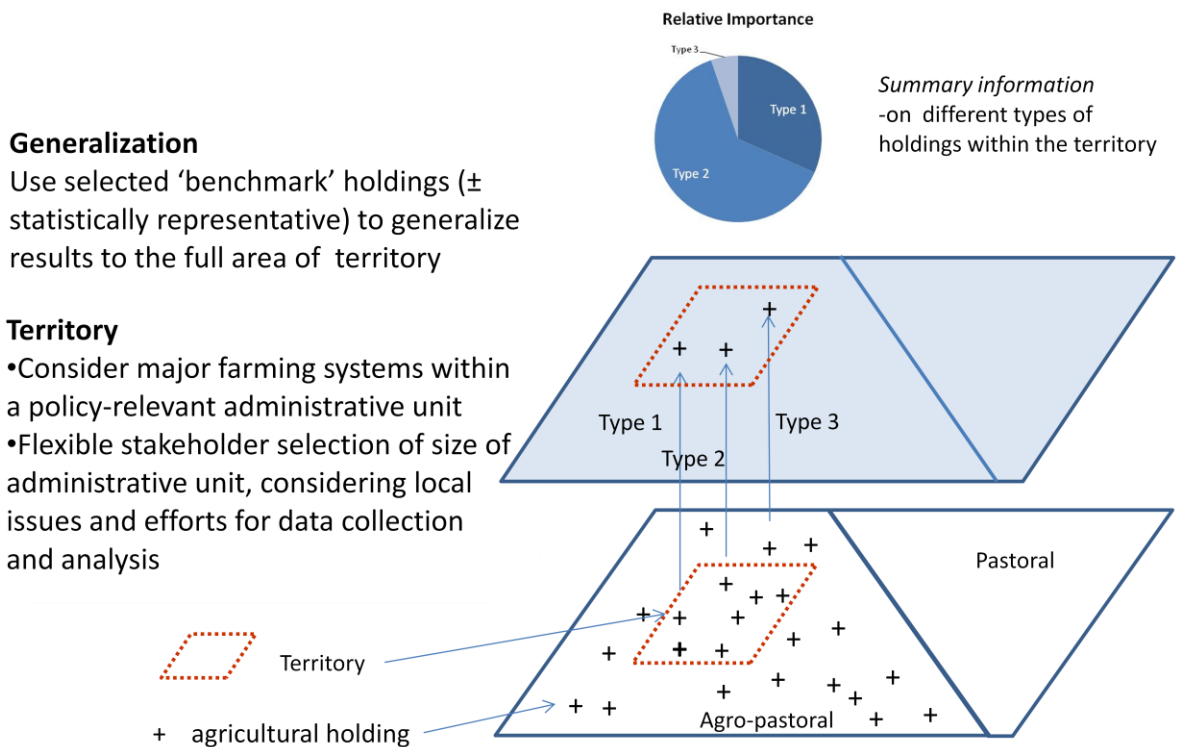


Figure 4: The generalization of results from holdings to farming system level within a selected territory.

Generalizing results from holding to policy-significant 'territorial' levels

Results from WAW analyses at holding level need to be generalized, cost-effectively and reliably, to scales relevant for policy and planning. One proposed approach involves the selection of statistically representative 'benchmark' types of holdings for different farming systems followed by suitable 'aggregation' of results to territorial level (Figure 4). Maximum use will be made of existing data (agricultural census or surveys) to establish a typology of existing holdings within a territory. Since for the protection of privacy the location of each holding is usually not released to the public, WAW will explore cost-effective approaches (including new surveys and/or use of expert knowledge) for identifying 'representative' holding types in the field for which interviews could be made on specific changes which have occurred over the years. Given the expected wide variability in data availability and diversity of holding types, WAW will develop a case-specific approach to generalizing results.

Forecasting transformations

WAW will make use of methods already developed for forecasting various aspects of transformation and associated impacts (e.g. cash balances associated with different cropping systems) under different scenarios of changing biophysical conditions (e.g. climate change and agro-ecological suitability) and socio-economic conditions (economic and policy analyses, resilience, labor markets, urbanization).

6.3. STEP 3: INFORMATION BASE AND DECISION SUPPORT

Appropriately designed information systems to facilitate data gathering and subsequent data exchange, nationally and internationally, will play a crucial role in ensuring WAW's effectiveness to support policy and planning processes. Some planned products and services to be provided through WAW are presented below.

	National and sub national	International
Products	<ul style="list-style-type: none"> • Training manuals • National Information system • National monitoring reports • Policy briefs 	<ul style="list-style-type: none"> • Standardized framework for monitoring transformation and impacts • Global information system • Periodic global assessment reports
Services	<ul style="list-style-type: none"> • Training • System of alert on new crises • Data/ information access 	<ul style="list-style-type: none"> • Capacity development / Awareness building • Research

Existing systems containing information relevant for monitoring information have been conceived with widely different purposes. WAW will therefore focus on developing synergies and promoting inter-operability, accompanied by the development of local stakeholder capacities, in order to facilitate ready access to the required data. WAW will grow as a continuously expanding network of already existing and newly created national observatories (and information systems) located in representative major farming system regions with linkages to the WAW Secretariat at FAO Headquarters in Rome.

6.4. STEP 4: POLICY AND PLANNING PROCESSES

National level

Results from national observatories will be effectively integrated in appropriate national to local decision making through a national WAW stakeholder coordination committee, linked to existing policy and planning processes. WAW will, in collaboration with this committee, promote (i) awareness building on transformation and related impacts (ii) stakeholder involvement in WAW implementation (iii) improved access to information on transformations, including policy briefs.

Policy briefs presenting *relevant background information for consideration during existing processes of policy formulation* will be formulated in order to support more evidence-based decisions on issues connected to transformations. At country level, these briefs will, among others, include information on

- Agricultural transformation and its relevance to local, national and international challenges - including in particular, food security and environmental sustainability.
- Historical development of transformation within the country, including pressures and drivers
- Current status and forecasts of transformation and impacts. Analyses of causal relationships between the outcomes of holdings and the objectives of various policies (e.g. trade, self sufficiency, input subsidies, extension, credit, land, water, forest, investment in infrastructure for rural development, etc.) will permit the identification of key policy issues requiring attention.
- Key considerations and development options for the main types of agricultural holdings associated with the main farming systems

International

In collaboration with international partners, WAW will

- develop and promote for wide adoption a standardized ‘internationally-comparable’ typology of agricultural holdings.
- prepare periodically global synthesis reports on transformations and widely disseminate this information to the public.
- mobilize appropriate research on transformations to be carried out through its international network of Technical Partners. (e.g. methodological refinements of the monitoring approach) to meet specific local policy and planning needs identified by participating observatories.
- coordinate and otherwise contribute to the training of stakeholders on use of the WAW monitoring method as well as provide assistance in preparing analytical documents to support policy and planning processes.

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References

- CIRAD, 2012. Illustration pour la mise en œuvre de la méthodologie WAW : la zone cotonnière du Mali. Centre de coopération internationale pour la recherche agricole et le développement. Montpellier. 38p.
- DFID. 1999. Sustainable livelihoods guidance sheets. <http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf>
- FAO. 2007. Approaches to linking producers to markets. Agricultural Management: Markets and Finance Occasional Paper, 13, 66p.
- FAO. 2011a. The state of the world’s land and water resources for food and agriculture (SOLAW) – Managing systems at risk. Food and Agriculture Organization of the United Nations, Rome and Earthscan, London.
- FAO. 2011b. Questionnaire for mapping land degradation and sustainable land management (QM), 58p. <http://www.fao.org/nr/lada/>
- FAO. 2005. A system of integrated agricultural censuses and surveys. Volume 1. FAO Statistical Development Series. 11. Available at <http://www.fao.org/docrep/009/a0135e/a0135e00.htm>
- FAO and World Bank. 2001. Farming systems and poverty. Improving farmers’ livelihoods in a changing world. <ftp://ftp.fao.org/docrep/fao/003/Y1860E/Y1860E00.PDF>
- World Bank. 2011. Global Strategy to improve agricultural and rural statistics. http://siteresources.worldbank.org/INTARD/Resources/AgStatistics10_web.pdf

Table 1: Selected indicators on capital assets at territorial level.

<p>Human (the quantity and quality of labor available -- skills, work capacity, health ... – necessary to use other 4 assets)</p> <p>Population with access to drinking water Percentage of rural children under five who are underweight Rural infant mortality rate per 1000 live births</p>
<p>Social (e.g. mechanisms/ rights based on group membership which facilitates cooperation, acceptance of norms,.)</p> <p>Food consumption per capita Population density and growth; age profile Proportion of the Agricultural population living above the poverty line Agricultural and non agricultural employment ; employment profile Number of farmer associations</p>
<p>Natural (e.g. natural resource base – land, water, biological resources, ..may be improved or degraded by human management)</p> <p>Land cover and use Importance forest and rate of deforestation Land and water area formally established as protected areas Water availability and potential for irrigation Rate of fragmentation (agriculture, forestry, pasture)</p>
<p>Financial (e.g. sources of income, savings, credit, easily disposable assets ..)</p> <p>Contribution of agricultural productions to total production value in territory (GDP territorial) Density of financing system Average of interest rate by type of loans Price variability for the main production types Characterization of main agricultural value chain Structural characteristics of land, labor and markets</p>
<p>Physical (created by economic production e.g. infrastructure, productive assets,.)</p> <p>Number of holdings; Livestock Agrarian structure (size of plots, forest, etc.) Access to market centers (distance, time); number of market centers (physical) Access to health centers and veterinary centers Density of road network Area equipped for irrigation Rural Infrastructure</p>

Table 2: Preliminary core set of structural indicators for the characterisation of agricultural holdings.

World Programme for the Census of Agriculture	Additional indicators usually included in national agricultural or other common surveys
Human (e.g. the quantity and quality of labor available -- skills, work capacity, health ... – necessary to use other 4 assets)	
<ul style="list-style-type: none"> • Sex; Age; • Household size 	<ul style="list-style-type: none"> • Level and type of education • Labor type (family; permanent employees; temporary)
Social (e.g. mechanisms/ rights based on group membership which facilitates cooperation, acceptance of norms,..)	
<ul style="list-style-type: none"> • Land tenure (e.g. legal, informal, rented ..); • Legal status (Household vs. non household –e.g. corporation, cooperative, government); 	<ul style="list-style-type: none"> • Level of self consumption (average) • Access to commons • Membership of rural producers association
Natural (e.g. natural resource base – land, water, biological resources, ..may be improved or degraded by human management)	
<ul style="list-style-type: none"> • Total area of holding; • Area of holding according to land use types • Presence of forest and other wooded land 	
Financial (e.g. sources of income, savings, credit, easily disposable assets ..)	
<ul style="list-style-type: none"> • Number of animals on the holding for each livestock type • Types of temporary crops • Types of permanent crops on the holding and whether in compact plantations • Presence of aquaculture; • Other economic production activities (e.g. fishing, collection of forest products,..) • Main purpose of the production (for home consumption or for sale) 	<ul style="list-style-type: none"> • Access to credit • Debt ratio (for commercial enterprises) • Financial remittances by emigrants
Physical (created by economic production e.g. infrastructure, productive assets,..)	
<ul style="list-style-type: none"> • Presence of irrigation 	<ul style="list-style-type: none"> • Debt ratio (for commercial enterprises) • Agricultural equipment

Table 3: Indicative list of 'Core' indicators used at holding level to assess livelihood outcomes focussed on food and nutrition security.

Food and Nutrition Security components and indicators (Encompasses multiple dimensions: availability, access, use or nutrition, and variability)		Synthetic analyses on
Availability		
1. Annual agricultural production : quantity of food produce by person		
2. Available production : quantity produced less quantity sold (including type of expenses) - intra consumption (seeds, feed) – gift – storage and transport wastes : ton or kg /person and par annual work units (by holding), in Kilocalorie (dietary energy supply (DES) in kcal/day by person), macro et micro nutrients.	Availability	
3. Food productivity of labor : Equivalent Kilocalorie of net value added (calculated from the average price of primary products consumed by rural households in the area) by annual work unit		
4. Share of land cultivated with staples crops (food crops) :		
5. Land cultivated by women.		
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Use/ nutrition		Overall Assessment of Food security at holding
6. Simplified index of Variety / Diversity of production: food (number of product types in relation to need), "cultural": number of products compared to local customs / national consumption.	Use	
7. Share of cereals, roots and tubers in total DES in% (a high% indicates low diversity of food supply)		
8. Fresh food		
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Food access		
9. Available production / needs for the family operation (kilo calorie, macro and micro nutrients)		
10. Number of months of lean season for energy (cereals or tubers)		
11. Income (total and on farm) per person compared to the food poverty line	Access	
12. Income (total and on farm) per person over the poverty line		
13. Number of meals per day during the lean season / average number of meals		
14. Share of food expenditure in total income		
15. Access to drinking water		

Note - This list is focussed on indicators related to crop production only. The final choice of indicators (Core and Supplemental) will be tailored to the main sources of local livelihoods (e.g. cropping, livestock, mixed etc) and determined in consultation with stakeholders. Synthetic analyses will be based, among others, on appropriately disaggregated (e.g. by gender) statistical summaries and local knowledge. Supplementary data would be collected as needed to assess the impact of intra annual variations (e.g. reflecting seasonal assets)

Table 4: Indicative list of indicators used at holding level to assess livelihood outcomes related broadly to the three pillars of sustainability.

Environmental
1. Soil quality
2. Biodiversity; Conservation of indigenous plants and breeds
3. Water and quality of water
4. Energy
5. Agricultural conservative practice
6. Air quality
7. Climate change impact due to activities of the agricultural holding during one year
8. N&P emission potential
9. Manure storage and application
10. Plant protection activities of the holding during one year
11. N&P emission potential
12. Manure storage and application
13. Plant protection
Social
1. Employment (annual work unit) : family labour units; external labour units (permanent – temporary), gender
2. Annual work units (total and family) by cultivated area, cattle, K.
3. Average wage paid by annual work unit (employees) by education level and gender (benchmark average salary for agricultural work on the territory)
4. Farm net Income expressed per family labour unit.
5. Farm net Income and total income by person
6. Net income by person compare poverty line
7. Number hours of works by week (employees)
8. Gap between men and women salaries
9. Land area managed by women; land owned by women
10. Use of child labour
Economic
1. Yields for main products (quantities/per unit ha, animal, boat)
2. Cultural intensity (cultivated per year / total land, irrigated/equipped)
3. Rate of exploitation of the herd; Percent of breeding females (ruminants)
4. Production (quantity, value and kcal)
5. Production costs. (Expenses / quantity)
6. Input effectiveness: qty and Kcal produced / per unit of fertilizer
7. Net value added : (gross product – (intermediate consumption – depreciation)
8. Capital productivity: Net value added / fixed capital used
9. Land productivity: Net value added / area of agricultural land
10. Labour productivity (apparent) by type of labour : Net value added / labour quantity (annual work unit)
11. Income : on farm by activity, off farm by activity

Note: Supplementary data would be collected as needed to assess the impact of intra annual variations (e.g. reflecting seasonal assets).