

**The Effectiveness of Small-Scale Agriculture Interventions on Household Food Security:
A review of the literature
(Phase 1, Part 2)**



Prepared for:

The Canadian Foodgrains Bank
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Guide to readers

This paper is organized into 3 main sections:

An introductory section provides a history and context for this study.

In the first section, a common language or conceptual framework is developed to relate agriculture and food security issues using existing models and frameworks from the literature. The Sustainable Livelihoods (SL) approach is used as the carrier framework wherein food production, food security, and nutrition outcomes can be 'located'. The assets-based model, which is derived from the SL approach, is used to review literature on agriculture, with emphasis on sustainable agriculture and agroecology.

A second section provides evidence of the contribution of sustainable agriculture, farming systems and agro-ecological approaches towards sustainable livelihood outcomes. Three key publications are highlighted as they include the largest survey of sustainable agriculture experiences to date, a strategic review of agricultural development strategies by two major multilateral agencies, and a gathering of world-renowned authors during the 1999 Bellagio Conference on agroecological innovation. This section also addresses selected articles that emphasize the need to address the effectiveness of agricultural interventions from the perspective of diversified household income generation strategies. Articles that address the policy and economic dimensions are included, with particular emphasis on an article on commercialization. Lastly, a few articles that emphasize women's multiple livelihood strategies are included. It is important to underline that the evidence section supports the need to work within a Sustainable Livelihoods (SL) approach and address diversified household activities.

A third section includes conclusions, key themes and possible next step scenarios. This last section is meant to guide a discussion about further steps and actions to be discussed during the February 14th. 2002 workshop.

Acknowledgements

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This paper is an exploration into a subject matter that is elusive and complex. The review of the literature led me to reflect about *how to learn* about the relationships between agricultural development interventions and a range of outcomes that contribute towards food security. As with any research endeavour, asking the right question is the most difficult step. While for some readers the temptation may be to model complex relationships into predictable paths, the evidence in the literature is that this will only be possible under controlled circumstances. As I traveled this journey, I received support and encouragement from the Steering Committee that leads this study; they have been patient and willing to adjust directions. My appreciation goes to: Dominique Caouette (Inter Pares), Stuart Taylor (Canadian Foodgrains Bank), Cliff Trowell (PARTNERS in Rural Development), Alan Schlachter, Michelle Jimenez and Barbara MacDonald (CIDA).

A special thank-you goes to the consultant team at PATH Canada, Peter Berti and Julia Krasevec, who have been excellent networkers, constantly sharing information. I appreciate the help from the advisors to the project: Lloyd Strachan, Jean-Charles Levallee, and Iain McGillivray.

This effort is timely and we are not alone in the exploration. Food security issues in the past have tended to be addressed mainly through agricultural production and the provision of safety nets to respond to security issues. This review of the literature shows that today there are new challenges and perspectives to embrace; many technical, organizational, and policy options have yet to be developed and understood:

"There is still a wide gap between the conceptualization of food security issues at the household level, the development of effective and generally accepted indicators and the design of operational instruments with which to address these concerns." (Thomson, 2001)

For those interested in responding to the challenge through the food production side, there is a need to acknowledge that: "...better human nutrition, a more important goal for agriculture than is food production alone, will not be achieved simply by greater output of grains." (Uphoff, 2002) As a forthcoming book suggests, the questions to ask are:

what will benefit people -- especially the poor and marginalized, including urban consumers and not just rural producers -- and at the same time *what will sustain the natural resource base* on which agriculture and indeed all human and other life depend? (Uphoff, 2002)

It is my hope that this effort contributes to answer some of these questions.

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Executive Summary

This study began with the task of demonstrating the effectiveness of small-scale agriculture interventions in terms of: rural households' increased access to food, increased income, reduced sale of assets, and reduced migration. These outcomes were proposed as key components of household food security, defined at the 1996 World Food Summit Declaration as: "All people at all times have physical and economic access to sufficient, safe and nutritional food to meet dietary needs and food preferences for an active and healthy life." The agricultural interventions focused on livestock, vegetable gardens, soil and water conservation, seed supply, diversification, and others. While there is literature available to show positive correlation between a range of agricultural interventions and yield increases, and household incomes, there are compelling reasons to suggest that these outcomes are the result of numerous variables that often lie beyond the agronomic activities that households control. Hence, the replicability of experiences and results appears as an elusive goal.

This review of the literature begins by summarizing a number of conceptual frameworks with the aim of linking agricultural and nutritional outcomes in a manner that is meaningful to a wide range of people, organizations and disciplinary orientations. The Sustainable Livelihoods (SL) Framework is presented as a relevant perspective or narrative. The SL framework emphasizes the different assets that can be supported and regenerated in any development intervention: physical, financial, social, human, and natural capital. A recent survey of sustainable agriculture experiences worldwide reports on agricultural accomplishments from over 50 countries on the basis of the five different types of assets. In addition, a recent diagram published by the International Food Policy Research Institute (IFPRI) provides a causal model showing the different variables that intervene between agricultural and other developmental interventions, and nutritional outcomes. The SL framework and its assets-based model, along with the IFPRI diagram are used to reflect on the nature of this literature review task, and also as a basis for reviewing key literature.

The literature reviewed is organized into two groups. First, there is a summary of several recent worldwide studies on sustainable agriculture, farming systems and agro-ecology. These studies document the significant contribution of agricultural interventions towards reducing rural poverty. While several of them highlight the need to address nutritional outcomes, only a select few do so in a systematic manner. The next group of literature suggests that the livelihoods framework is replacing the emphasis on small-farm production and points towards the need to understand multiple household livelihood strategies, rather than focusing primarily only on small farm production. The articles included provide justification for this shift from both a policy and an economic perspective. A key article on the commercialization of agriculture provides an analytical framework that complements the IFPRI diagram and highlights key variables that influence the link between agricultural production and household income. The next group of literature emphasizes a gendered approach to agricultural interventions in recognition of women's strategic role in production and household nutrition.

The literature reviewed suggests that following:

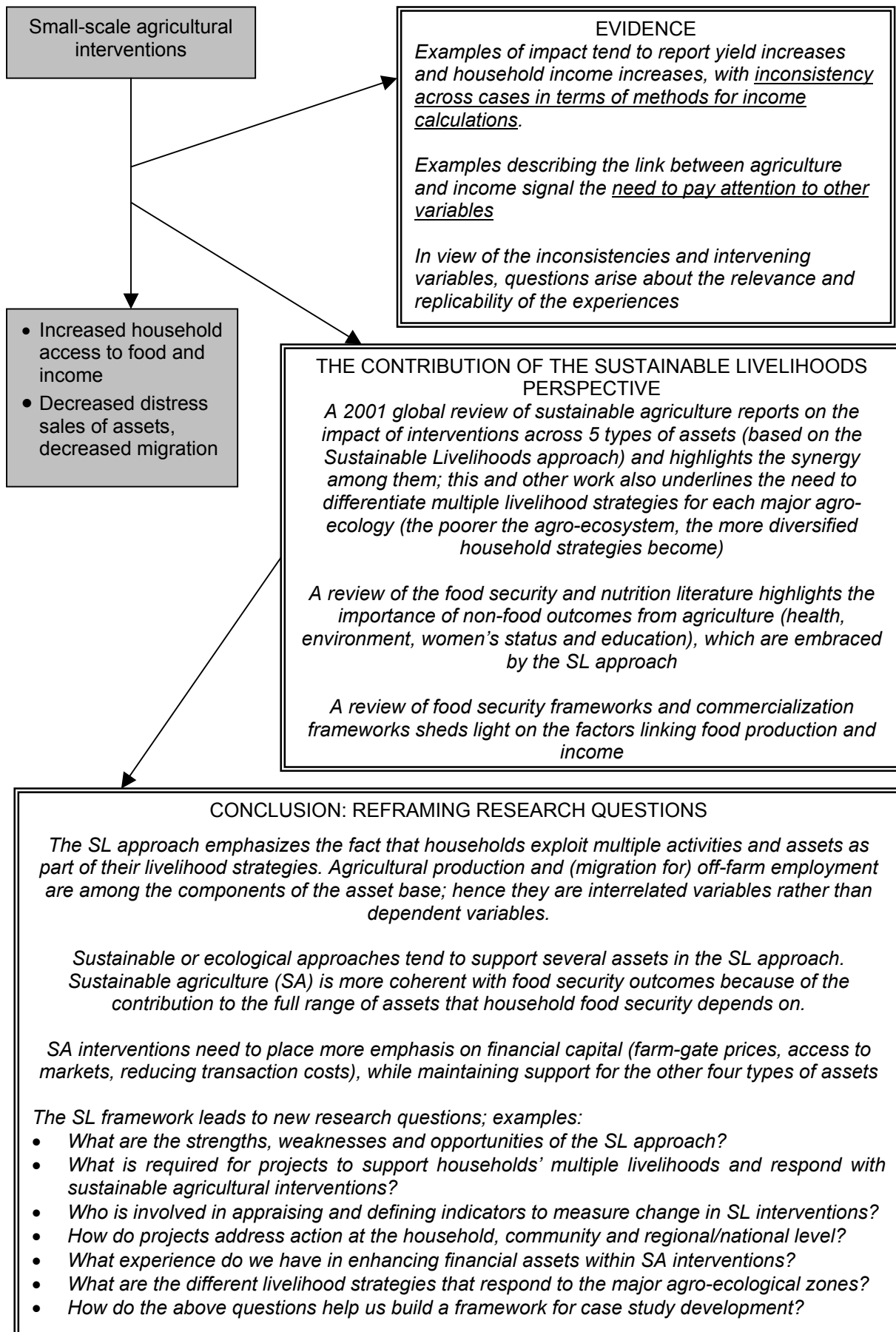
- Those agricultural interventions that contribute towards the five types of capital are more likely to contribute towards food security in that women's status and education are part of social and human capital, and a regenerated natural capital is a contributor to healthy environments.
- Households facing the risks associated with rainfed agriculture tend to diversify their sources of income, and that often includes off-farm activities; an emphasis on livelihood strategies begins to address this fact.
- Agricultural development strategies need to become more agroecozone-specific and address multiple livelihood strategies that households employ to increase income.
- A proxy for permanent household income is the total expenditure, including value of home-produced food.

The report concludes with a number of themes that require acknowledgement and attention:

- Appreciation of multiple livelihoods and diversification strategies, in lieu of a focus on the small farm *per se*.
- Appreciating how agriculture and other rural activities are interwoven into diversified income streams, namely the integration of agricultural, livestock and forest incomes and risk mitigation.
- Addressing agriculture as part of livelihood strategies: some argue that agriculture is no longer *the* key engine of rural growth, while others argue that it remains the best option in that a 1% increase in yields is associated with a 0.12% increase in the Human Development Index.
- Understanding and assessment of nutritional outcomes as part of the appraisal of agricultural interventions, which in turn calls for special attention to household dynamics and gender and to participatory adaptive research and participatory assessment.
- Differentiating between the needs of commercial farmers and those of subsistence farmers with emphasis on agricultural interventions that regenerate different assets.
- Addressing interventions on a location and agroecologically-specific manner which includes a differentiation between urban, peri-urban and remote settings, and
- Testing and integrating approaches that seek to enhance many assets as possible.

This study suggests that the above themes can best be addressed when all parties have co-created and embraced a common perspective. The SL framework has been adopted by DFID (UK) and other development organizations including UNDP, CARE and OXFAM have developed their own versions. Reference is made to a current effort with the FAO to utilize the SL framework. There is an opportunity now to develop a Canadian version that enhances the work of all the partners in this research.

The following diagram provides a reader with a 'roadmap' to summarize the direction of this paper. The boxes with gray shading represent the original Terms of Reference for the study.



The Context and Rationale

The History

In the fall of 2000, a group of NGOs joined with CIDA's Program Against Hunger, Malnutrition and Disease (previously known as the Food Aid Centre) to plan a workshop that would bring together a diverse group of NGOs, academics, and CIDA staff to discuss and share evidence for the effectiveness of food security interventions. The two-day meeting was held in March 2001, with approximately 50 people in attendance.

Following the workshop, the planning committee formed a working group to follow up on the recommendations. The key members of the working group are: Dominique Caouette (Inter Pares), Stuart Taylor (Canadian Foodgrains Bank), Cliff Trowell (Partners in Rural Development), and Alan Schlachter (replaced Joanne Moores, CIDA's Program Against Hunger, Malnutrition, and Disease).

The Purpose

Given the context and history already described, the working group identified the following two-part purpose statement to guide the terms of reference for the literature review:

- a) Identify and summarize key academic and practitioner literature concerning the effectiveness of small-scale, rural agricultural interventions in increasing access to food at the household level and improving nutrition. (The working group has agreed to research household access to food and nutritional outcomes under a separate contract).
- b) Define relevant research questions for further critical analysis.

Use of Results

As supporters and implementers of small-scale, rural agricultural interventions, the participating organizations will use the information from this study to inform resource allocation and project planning. Information from the study will be made available to any organization with an interest in small-scale, rural agricultural interventions.

It is assumed that all parties are participating in this research project in good faith, with a common interest in programs that will most effectively address the needs and basic human rights of those living in poverty and offer sustainable alternatives to hunger, malnutrition, and disease.

Methods

This review of the literature on the effectiveness of agricultural interventions comprised two parallel efforts: identifying conceptual frameworks to improve our understanding of the relationship between agriculture and food security, and identifying documents with evidence to quantify and qualify those relationships. A major challenge in this research has been the fact that there is compelling evidence in the literature to suggest that the types of interventions and outcomes proposed in the Terms of Reference are best explored from a broader perspective.

Keywords. A first round of searches focused on literature that addressed the conceptual and broader dimension of the subject matter using the following keywords: nutrition, food production, food security, impact, and agriculture. A second round shifted attention to other keywords: agriculture (livestock, diversification, gardens, soil and water conservation, ecological, seed banks, regeneration), household food access, income, distress sales, seasonal migration, and livelihoods.

Scope and limitations. This review is not comprehensive: many choices were made in selecting articles and books with emphasis on items that reported impact of agricultural interventions across several types of assets as per the Sustainable Livelihoods (SL) approach. The types of agricultural interventions in the Terms of Reference (TORs) for this study fall within two (of five) types of assets in the SL approach: improvements to natural capital and improvements to physical capital. The specific outcomes (increased household access to food and income, decreased distress sales of assets and seasonal migration) are influenced by additional variables. A table provided in the original TORs was initially used to document a selection of articles using that framework (see Annex 3). However, the author found compelling evidence in the literature indicating that the SL approach is a more strategic means to demonstrate the effectiveness of agricultural interventions. The study is therefore limited by the fact the SL approach has yet to be embraced by the participating organizations as a framework within which to identify and agree on the variables and keywords for each type of asset.

Search engines

- Ingenta & UnCover is a database service that lists the table of contents of 18,000 journals in all subject areas. It can be searched by journal and article title, by author, and keywords. The database is worldwide in coverage and contains coverage commencing in 1988. Approximately 50% of the journals are in the arts, humanities, and social sciences.
- Scirus covers more than 60 million science related pages from the Web as well as membership sources such as ScienceDirect, MEDLINE on BioMedNet, Beilstein on ChemWeb and Neuroscion¹.
- Searches for books and grey literature were also carried out through the Tri-Library search engines (TUG) comprising the University of Guelph, University of Waterloo and Wilfred Laurier University.
- Gateways: www.developmentgateway.org; www.fao.org/sd/2001/pe0903_en.htm

¹ Ingenta and Scirus did yield common journal articles, suggesting that a fairly good coverage of refereed sources was achieved.

Developing a common framework to relate agriculture and food security

The March 2001 Food Security Workshop referred to a Conceptual Framework for Food Security (Annex 1) as a basis for discussion about the effectiveness of food security interventions. While the framework served as an initial platform for a conceptual discussion, a full consensus was not reached on its applicability. Some methodological challenges remained in terms of how to agree on the specific measures, indicators and complex relationships that are difficult to isolate. Some empirical concerns remained, especially with regards to documenting “hard evidence” for food security interventions. On the strategic front, the group felt it was important to review evidence in the literature as well as methodological issues.

The workshop proceedings mention the need for a framework that captures the different factors that intervene in food and nutrition issues and that acknowledges the many feedback loops. There was also some concern voiced by donors about the seemingly broad definition of food security (Food Security Workshop, 2001). The need for universally acceptable frameworks and definitions has been addressed in the literature (Sobal, et al., 1998; Sobal, 1999; Maxwell, 1990; Smith, et al., 1993) and many analysts have concluded that the challenge requires more than that; it calls for new ways to bridge disciplines and sectors (Maxwell, 1997; Maxwell, 1998; Hoddinott, 1999; Sutherland, 1999b). This review of the literature sheds light on some of the underlying causes behind the unease expressed by the participants. The underlying causes are described along several levels of discourse or narratives that seem to be at play.

Paradigms/ general overview

An acknowledgement is necessary about the contrasting mindsets from which we view food and nutrition development interventions. Some seek predictable actions with verifiable indicators that can demonstrate impact. Others view the challenge in a holistic manner, addressing multiple perspectives and outcomes that are negotiated with stakeholders, with more emphasis on learning and less on predictability (Maxwell, 1996). Learning is possible when different stakeholders agree on the tools and indicators that will be used to track change and the literature is rich with experiences demonstrating this in practice (Thompson & Guijt, 1999; van der Veen, 2000; Lightfoot, et al., 2001). Practitioners in the field of natural resource management have a track record working with indicators and multiple stakeholders through an approach known as *adaptive management* (Lee, 1993; Lee, 1998; Lightfoot, et al., 1991; Röling & Wagemakers, 1998; Woodhill & Röling, 1998; Ingles, et al., 1999). In this context, indicators serve more as tools for course correction and less as predictors.

Figure 1 summarizes the differences across these two paradigms. These different perspectives have been at the root of the sustainable agriculture debate as well (Pretty, 1995). It is important to underline that the approaches are not mutually exclusive and can be mutually reinforcing (Jiggins & Röling, 1997; Engel, et al., 2000; Guijt & Engel, 1998).

Figure 1. Modern and post-modern currents in development (Maxwell, 1996: 161)

	Modern	Post-modern
Underlying reality	Simple, uniform	Complex, diverse
Objectives	Growth	Development
	Preoccupation with macro	Preoccupation with micro
Research approach	Measure	Listen
	Survey	Participatory Rural Appraisal
	Reductionist	Holistic
	Deduction	Induction
	Abstract models	Complex reality
	Aggregate	Disaggregate
Planning approach	Plan	Enable
	Model	Interact
	Top-down	Bottom-up
	Centralize	Decentralize
Implementation	Blue-print	Process
	Role culture	Task culture
	Standardization	Flexibility, innovation

Organizations and individuals address issues of communication, project design, planning, and implementation & evaluation from different perspectives. These differences deserve attention as they influence how agencies address a subject matter. Multi-disciplinary planning challenges are at the heart of how different organizations address the variables (Maxwell, 1997). The nature of the organizations will influence the narrative. In a study comparing approaches to poverty assessment by the World Bank and Oxfam, the contrasting organizational realities were identified as a key issue underlying the different constructs of policy messages:

...despite the range of technical choices which inform the practice of poverty assessment, the way that policy is formulated means that it is the situated agency and objectives of policy actors themselves that are perhaps the most important component in shaping the policy narratives that they put forward. (McGee & Brock, 2001)

Significance

Post-modern perspectives are compatible with many NGO small agricultural interventions that emphasize participation and local planning; whereas nutritional interventions that provide direct nutrient supplements may be best examined within the modernist perspective. The former is more holistic, whereas the results from the latter are more predictable. Organizations often take these perspectives for granted; yet the differences may need to be addressed in order to build common perspectives among them. Action-research is very much based on the post-modern perspective, yet some authors underline that it can embrace modernist or positivist elements {Jiggins and Röling, 1997}.

Development Approaches

Development approaches – such as sustainable livelihoods, poverty assessments - provide the overall orientation within which food and nutrition activities take place.

In the UK, the Sustainable Livelihoods (SL) framework seems to have filled that role within the Department for International Development:

SL approaches put the poor at the centre of analysis and aim to identify interventions to meet their needs and opportunities in ways not dominated by individual sectors or disciplines. Part of the value of the SL approach therefore lies in providing an inclusive and non-threatening *process* by which the capacity of development specialists to think beyond conventional sectoral or disciplinary boundaries can be enhanced. This is in addition to whatever improved *products* it achieves in terms of e.g. better design of the interventions themselves. (Farrington, 2001)

The Sustainable Livelihoods (SL) framework promoted by DFID is a useful conceptual map that presents the major factors that affect people's livelihoods, and the relationships that exist among them. It does not present information in a linear manner and does not attempt to present a "model of reality".

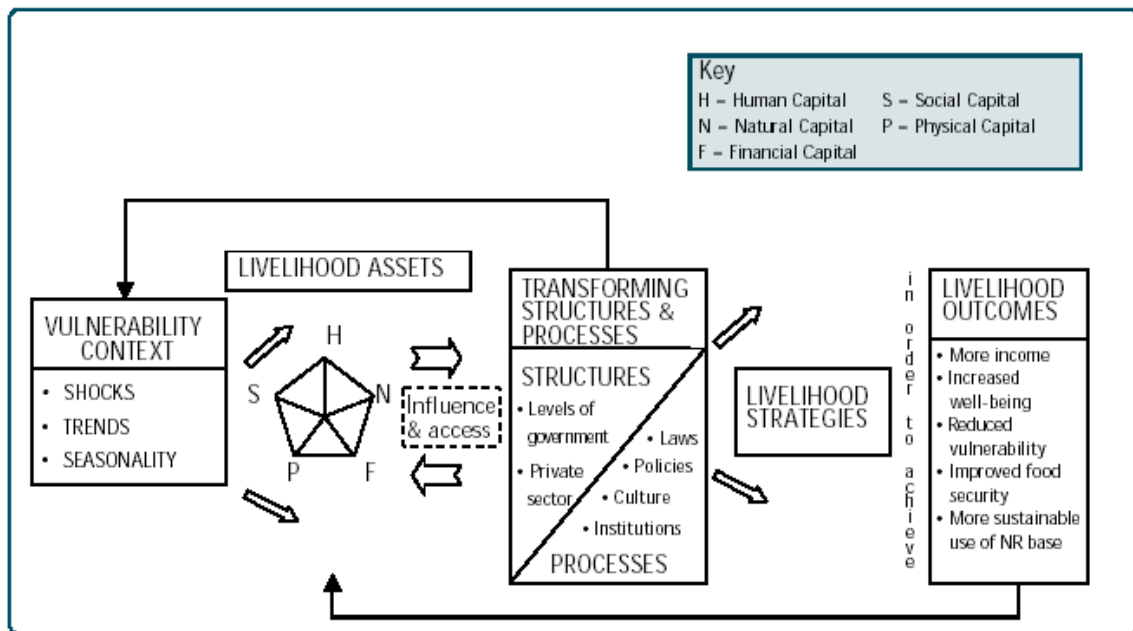
Its aim is to help stakeholders with different perspectives to engage in structured and coherent debate about the many factors that affect livelihoods, their relative importance and the way in which they interact. This, in turn, should help in the identification of appropriate entry points for support of livelihoods. (DFID, 2001).

The framework is used as a basis for multiple stakeholders to debate and learn from contrasting perspectives. This approach is coherent with Simon Maxwell's notion that in a post-modern perspective, different stakeholders negotiate the issues that matter to them; no single objective analysis is expected, nor a simple set of indicators that are equally relevant to all parties. (DFID, 2001)

Central in the SL framework is the people factor, and it is expressed through the notion of "livelihood assets" comprising:

- human capital (H),
- natural capital (N),
- financial capital (F),
- social capital (S), and
- physical capital (P).

Figure 2. The sustainable livelihoods framework



These five categories need not be seen as the only ones. Other authors refer to a comparable combination: financial capital, manufactured capital (composed of physical infrastructure such as machinery, chemical fertilizers, pesticides, housing, office buildings, schools, roads, sewers, factories, water systems), human capital, environmental capital, and social capital. (Flora, 2001)².

The fact that the framework does not attempt to be a model of reality signals a significant shift in approach. The SL framework seems to follow the approach developed by soft systems methodology³ where modeling is used to:

...find out about a situation in the real world which has provoked concern; select some relevant human activity systems; make models of them; use the models to question the real world situation in a comparison phase; use the debate initiated by the comparison to define purposeful action which could improve the original problem situation. (Checkland & Scholes, 1990)

² For a good review of the characteristics of each type of capital, refer to Ellis (2000).

³ 'Soft systems methodology' (SSM) is a systems approach that emerged from the analysis of complex organizational problems. SSM uses diagrams or models as a means of talking *about* a reality, rather than models *of* reality (Bennetts, et al., 2000). In SSM, the models are visual illustrations of people, issues, relationships; they are referred to as 'rich pictures' in that they capture all the rich, multidimensional issues that are part of a system. (Annex 2 provides further background on SSM.)

The SL framework appears relevant to this study in that it is rooted in the aim of poverty reduction. It emphasizes assets and embraces different perspectives that emphasize particular dimensions (process, structure, strategies, outcomes, vulnerability context) to be 'located' on the same platform⁴. For the purposes of this study, however, it does not explicitly address the relationship between food security and nutritional outcomes, both of which are listed under "Livelihood outcomes". However, as we will explore later in this document, the framework sets a good platform for an assets-based model of agricultural systems (Pretty & Hine, 2001) that serves this study well.

The following is a synthesis of the SL approach as per a recent book by UNDP on the subject (Helmore & Singh, 2001):

The concept:

Livelihoods are composed of people's activities (formal and informal jobs, self-employment), assets (ownership and access to five types of assets: human, social, natural, physical and financial), and entitlements (pensions, social safety nets, unemployment insurance, human rights).

The SL criteria:

SL involve a capacity to cope with and recover from shocks an stress (adaptive capacity), economic efficacy, social equity and gender, and ecological integrity.

The SL approach:

Emphasis is placed on assets rather than needs, self-empowerment, visioning of improved futures in measurable terms (using existing methodologies like appreciative enquiry and other approaches than emphasize visioning), and local action supported by outside help.

SL actions:

Attention is placed on policy linkages and processes across the micro, meso and macro levels, governance, technology and investment.

SIGNIFICANCE

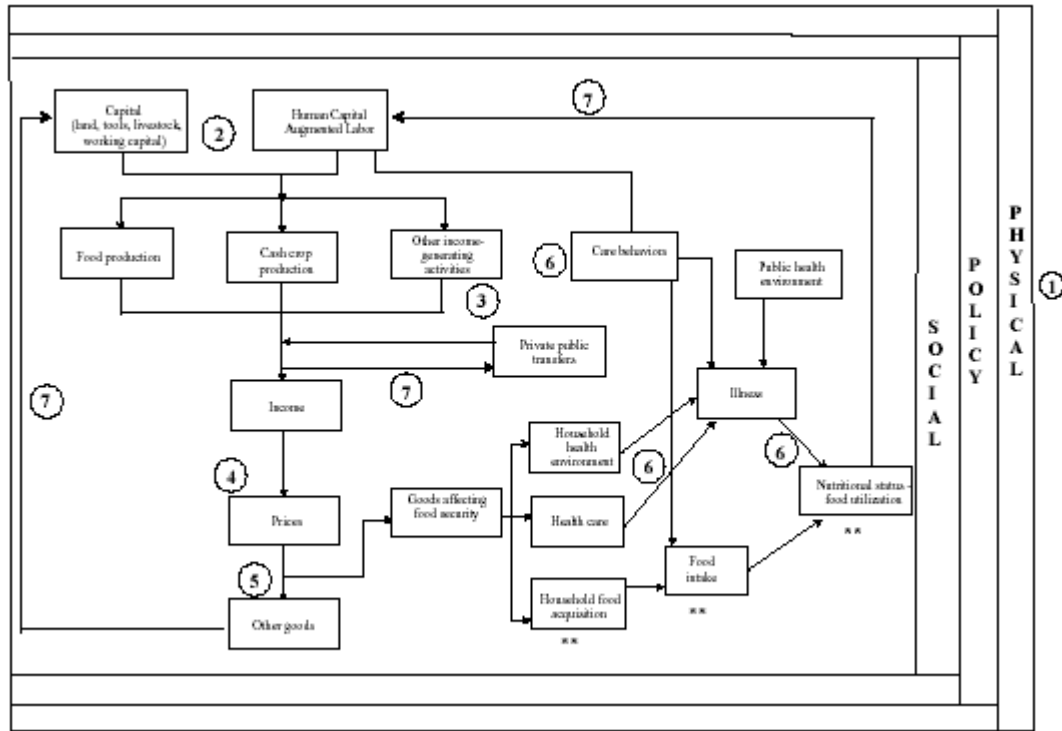
The major contribution of the SL framework has to do with the appraisal of a situation across the different types of assets. For the purposes of this study, it helps re-orient our thinking towards agricultural interventions that are designed to enhance existing and diversified household livelihood strategies.

⁴ In the ODI Natural Resource Perspectives series (UK), writers from different disciplines endorse the fact that the SL approach puts people at the centre of the analysis (Bryceson, 2000; Edwards, 2000; Goldman, et al., 2000).

Conceptual frameworks

A recent IFPRI Technical Guide (Hoddinott, 1999) provides a framework that highlights the determinants of food security (see Figure 3).

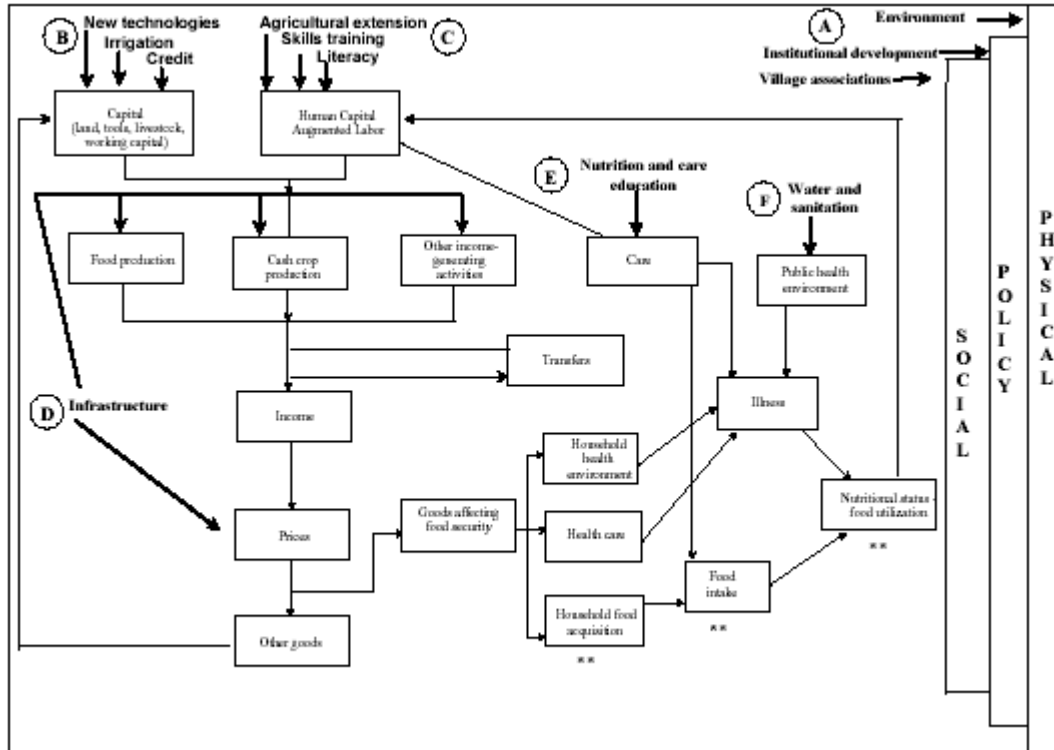
Figure 3: The determinants of household food security (Hoddinott, 1999)



- Legend**
1. Physical, social and policy frame
 2. Household resources and endowments: labour and capital
 3. Household allocation of endowments
 4. Price determinants for level of consumption supported by level of income
 5. Consumption (goods affecting household and individuals and other goods)
 6. Good that will affect food security (food consumption, acquisition), good related to health care (e.g. medicines), and goods that affect health (environment, shelter, sanitation, water). (Stars emphasize food security and nutrition outcomes.)
 7. Feedback effects (food security is not static); the provision of agricultural extension, allocations in education, are among the examples of interventions that would be described by this loop. {Hoddinott, 1999: 4-6}

The framework is relevant in that it captures the different intervening factors that link food production and nutritional outcomes. The framework is further used to locate the different types of development projects and the impacts they may have on household food security (see Figure 4).

Figure 4: The impact of development interventions on household food security (Hoddinott, 1999)



Legend

- and forest management (environment), improving policies for institutional support (policy), strengthening farmer groups (social).
 - B. Interventions to increase the return on capital investment: irrigation, credit, and new technology.
 - C. Improving knowledge and social capital: extension services, rural development projects, skills training, literacy and education.
 - D. Interventions to improve infrastructure, especially roads.
 - E. Interventions to improve knowledge about good health care and nutrition practices
 - F. Interventions that improve the health environment including safe/improved access to drinking water and health services
- { Hoddinott, 1999: 7-9}

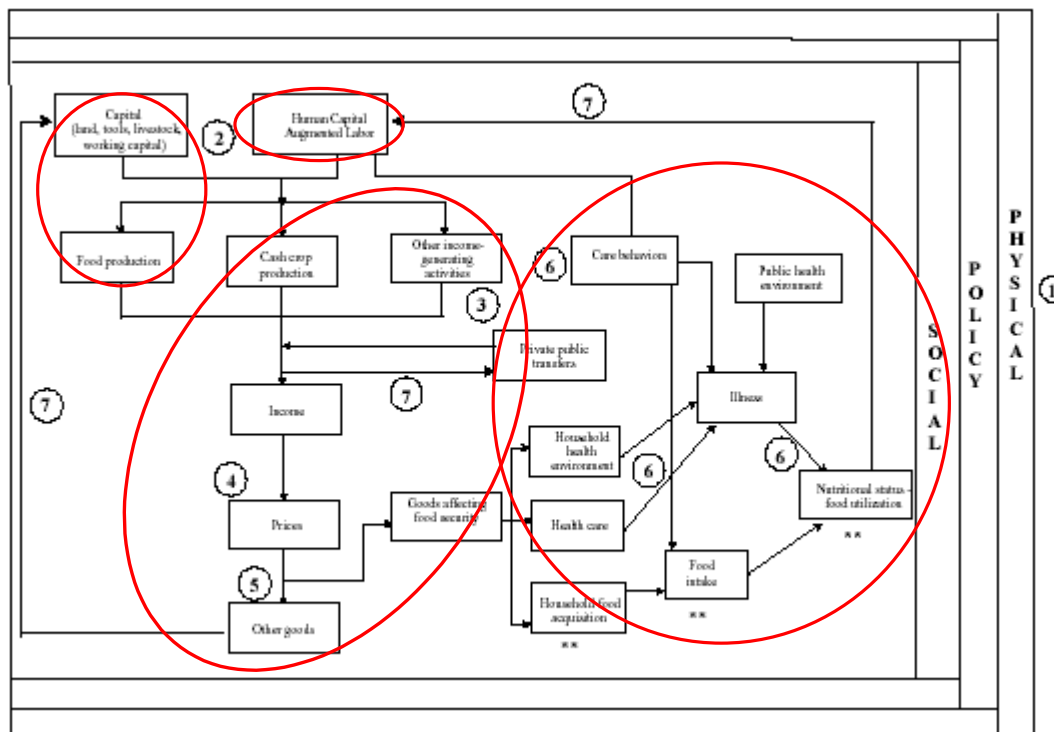
The framework shows, for example, that interventions in the A, B and C categories that are aimed at improving the environment in which households exist (aiming at increasing levels of human and physical capital) do not directly affect food security outcomes. Instead, they may increase incomes. However, the links between incomes and food security outcomes – while positive- are weak. The reasons for these are many: food is not the only input towards nutritional status or food utilization; increased food access will not necessarily increase food utilization where other factors, such as health or environment are not favourable. Another cause is ignorance: households may not be aware of all the components of a healthy diet. A third cause may refer to the competing demands for limited financial resources.

What this all points at is the complementarity between conventional development activities and health and nutrition interventions (Hoddinott, 1999). However, there is scope for unexpected outcomes when holistic, participatory approaches are integrated with nutrition interventions:

In those projects where there is to be an emphasis placed on beneficiary participation, it might very well be the case that beneficiaries choose interventions that have their largest impact on an outcome other than food security or nutrition. (Hoddinott, 1999)

The IFPRI framework captures the different assets proposed in the Sustainable Livelihoods framework. On the top left, natural and physical capital are referred to. On the top center, human capital is mentioned. Financial capital covers many of the variables in the center, and finally social capital is related to many of the household behaviours and decisions depicted on the right side of the diagram.

Figure 5: The determinants of household food security and their relationship to the assets-based approach proposed by the Sustainable Livelihoods framework (adapted from Hoddinott, 1999).



Significance

The IFPRI framework utilizes the notion of different types of assets/capital and is compatible with the SL framework. It signals the need for complementary interventions that address both agriculture and the other assets that contribute towards food security.

Definitions

For the purposes of this study, household food security is defined as:

“All people at all times have physical and economic access to sufficient, safe and nutritional food to meet dietary needs and food preferences for an active and healthy life.” 1996 World Food Summit Declaration

However, readers should be aware of the large number of definitions in the literature:

Food security is a concept that has evolved considerably over time. There are approximately 200 definitions and 450 indicators of food security. One volume on household food security (Maxwell and Frankenberger, 1992) lists 194 different studies on the concept and definition of food security and 172 studies on indicators. A review that updates this literature (Clay, 1997) provides an additional 72 references. Both publications are highly recommended to development practitioners who are interested in understanding the development of the concept of food security. Other highly recommended reviews of this literature are Riely et al. (1995), Chung et al. (1997), and Chirstiaensen and Tollers (1995). (Hoddinott, 1999: 2).

“A rural household needs the following to be food secure:

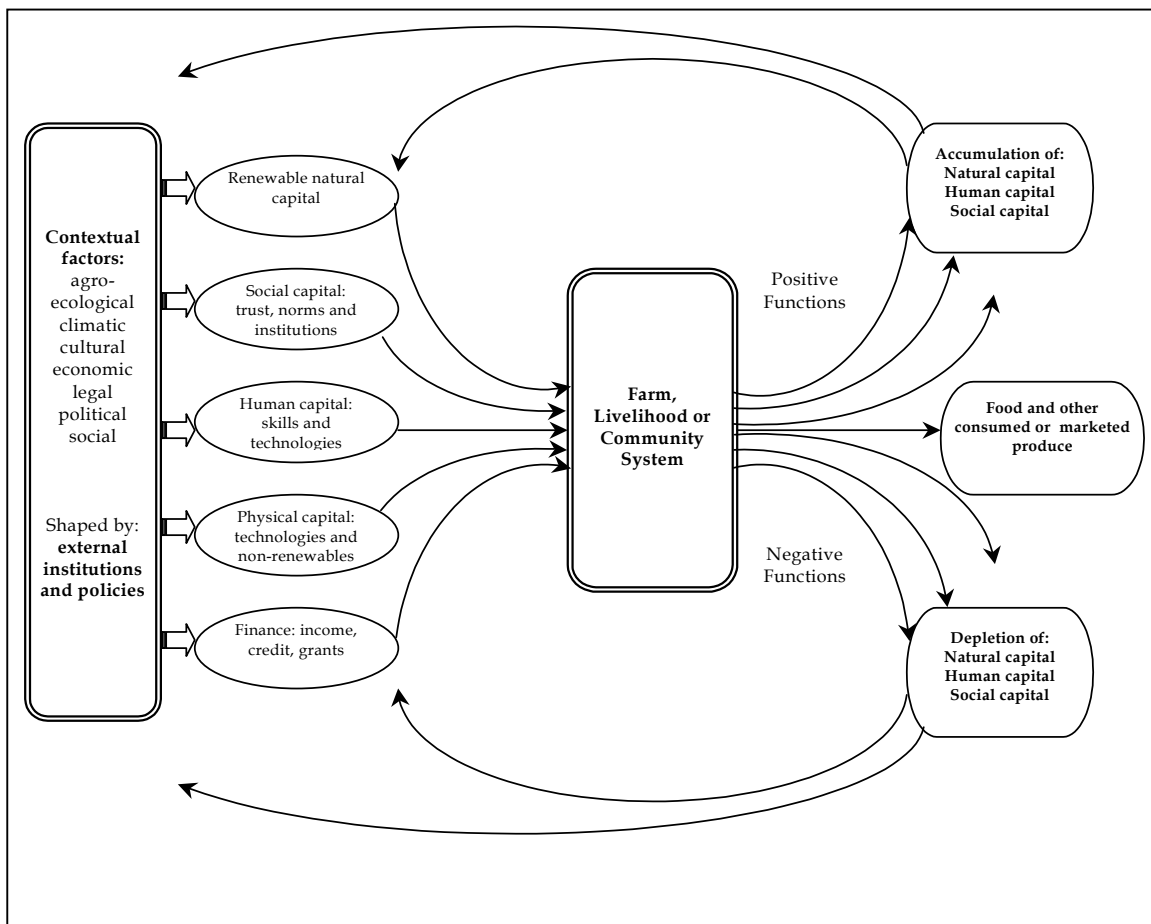
- i) an adequate supply of food, either grown on the farm or bought with earned income, and measured in kcal or kg of cereal equivalent;
- ii) a variety of food containing the necessary mix of protein, carbohydrate and fat, together with vitamins and mineral, for a healthy diet;
- iii) the appropriate quantity and diversity throughout the year, particularly during months of shortage and/or insecurity.” (Pretty & Hine, 2001)

Using the assets-based model to assess the effectiveness of small scale, rural agricultural interventions

The Assets-based model by Pretty and Hine (2001: 21) appears below. The model focuses attention on the five types of capital that make up the livelihoods assets (from the Sustainable Livelihoods Framework); on how they are transformed through the 'farm, livelihood or community system'; and on the outcomes of that transformation in the form of accumulation of capital, depletion of capital, and food consumed or marketed.

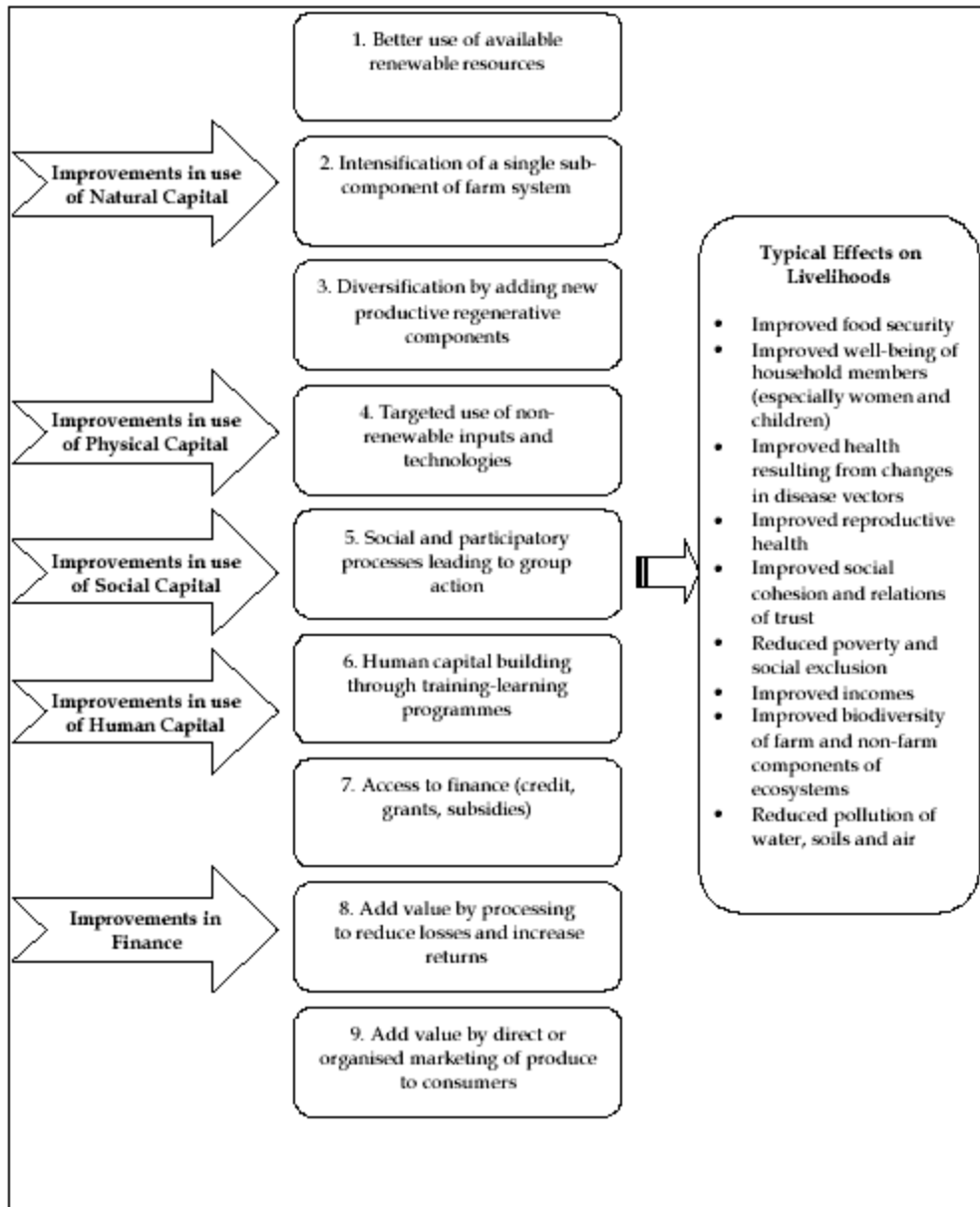
Sustainable systems are those that produce the food and other consumables while maintaining or increasing the natural, human and social capital (positive function). Non-sustainable systems also produce food and consumable for market, yet they deplete the natural, human and social capital. These depletions are often disregarded as “externalities”, although there is increased attention today on the notion of full-cost accounting to acknowledge those negative functions that ultimately make such systems un-sustainable (Redclift, 1996; Pretty, 1995).

Figure 6: The assets-based model of agricultural systems (Pretty & Hine, 2001)



Pretty and Hine (op. cit.) further specify the range of entry points -or interventions in sustainable agriculture- that belong to each of the five types of capital. The range of outcomes is based on the Sustainable Livelihoods framework.

Figure 7: Entry points for sustainable agriculture improvements leading to more sustainable livelihoods (Pretty & Hine, 2001)



Features and relevance of the assets-based model

The assets-based model and the entry points diagram are relevant to this study in that they signal the following:

- agriculture is a cyclical process where each transformation has an impact across the different assets that households and communities manage
- beyond producing food, agriculture contributes to the accumulation of capital, or to its depletion
- the combination of entry points is important, as most interventions work to combine more than one type of capital improvement; in the nutrition literature the notion of interventions in different sectors reinforcing each other is also reported (Maxwell, 1998)
- the effects of the interventions cover a range of livelihood outcomes that are interrelated

The assets-based model helps locate the scope of this study and signals some of the additional dimensions that merit attention:

- the interventions that are the focus of the TORS for this literature review all fall under the natural capital classification: livestock production, diversification of local agriculture, market gardens, soil and water conservation techniques, intensifying agriculture based on local ecological principles, and seed banks (which also contribute to physical capital)
- the type of outcomes that are the focus of the TORS for this literature review (increased household access to food, increase household income, decreased distress sales of household assets, decrease in seasonal migration) fall under the natural capital category (food) and the financial category (income, sales, remittances from migratory work)

Significance

- *Sustainable agriculture interventions are different from conventional ones in that they a) contribute to the accumulation of natural, social and human capital, and b) they integrate improvements that have synergistic impact (Pretty and Hine, op.cit.);*
- *The literature on food security and malnutrition signals that food production on its own is an insufficient contributor to improved food security and reduced malnutrition; in particular women's education is found to have the strongest impact on child malnutrition (Smith & Haddad, 2000; Alderman & Garcia, 1993); women's education is part of human capital. Reducing the incidence of disease is another contributing factor of comparable importance (Bouis & Haddad, 1990; Webb, et al., 1992; Haddad, et al., 1996);*
- *The study by Pretty and Hine (op.cit.) found that the most common types of project interventions included 'better use of locally-available resources' (natural capital) and 'human capital building through continuous learning programmes' (human capital); and that more than half of all the projects integrated 2 or 3 improvements as part of their interventions.*

Integrated analysis

Broad conceptual map

The Sustainable Livelihoods (SL) Framework emphasizes the different types of livelihood assets (human, social, natural, physical and financial) as well as the range of livelihood outcomes (more income, increased well-being, reduced vulnerability, improved food security, more sustainable use of NR base). The SL framework provides a broad conceptual link between agriculture and nutritional outcomes.

Causal relationship between agriculture and food security

The Determinants of Household Food Security model (Hoddinott, IFPRI) provides a causal representation that addresses physical, policy, social, financial and natural capital. It is relevant in that it ‘locates’ the impact of six different developmental interventions (A: environment, institutional development and village associations; B: new technologies, irrigation and credit; C: agricultural extension, skills training and literacy; D: infrastructure; E: nutrition and care education, F: water and sanitation) as they affect food security. The model highlights the variables affecting household food access, household income, and to some extent economic decisions (distress sales and labour migration), and does so in the context of variables that are critical for nutrition outcomes (care behaviour, public health, health care, illness, food intake). In other words, sustainable agriculture can contribute towards food security through its contribution to social and human capital in a significant manner, over and above its contribution in terms of increasing access to food (Pretty & Hine, 2001). “More food is not necessarily the most direct path to improved livelihoods. Malnutrition is lower, the more the women (mothers): become empowered, become literate, have time to care for / feed their infants, have safe drinking water, have reasonable access to health services” (IFAD Office of Evaluation and Studies, 2001)

Categories of agricultural interventions

This model (Pretty & Hine, 2001) provides nine categories of improvements in sustainable agriculture based on the five types of assets (capital) in the SL model. It emphasizes the contribution of sustainable agriculture interventions in the context of the livelihood outcomes, especially with regard to environmental health, and education.

Significance

These models together set the stage for this study. The key contribution is that sustainable agriculture enhances the five types of capital assets that food security outcomes depend on. NGOs happen to be well equipped at supporting communities to enhance the first four types of assets, though they will require additional strategies to fully address the financial one.

Table 1 summarizes the five types of assets, the nine types of sustainable agriculture improvements along with examples, and locates the original variables in the TORs for this study in that context. The table shows how there are key intervention dimensions that need to be addressed (notably those that cover human, social and financial capital), as they are the strategic link between sustainable agriculture and nutritional outcomes within a Sustainable Livelihoods framework.

Annex 3 includes a set of tables that were initially used to track literature along the original TORs but which was discontinued; it is provided here only as a general reference of how far the analysis has evolved during this learning journey.

Table 1: A review of Sustainable Agriculture Improvements

Type of capital improved	Types of improvements	Examples	Type of Intervention in TORs	Remarks
Improvements in natural capital	<ol style="list-style-type: none"> Better use of available renewable resources Intensification of a single sub-component of farm system Diversification by adding new productive regenerative components 	<p>Water harvesting, rotational grazing, soil and water conservation, contour cropping, terracing, composting, livestock manures, irrigation scheduling, habitat management for pest predators, drainage systems, raised beds, bio-pesticides and bio-fungicides.</p> <p>Double dug beds, adding vegetables to rice bunds, digging a fishpond, kitchen gardens, gully cropping, silt traps.</p> <p>Legumes in cropping systems (cover crops, green manure) and pastures, integrated livestock (poultry, stall-fed ruminants), fish in rice fields, <i>Azolla</i> in rice, trees in cropping system, woodlots, natural enemy releases for pest control, habitat management for pest control and enhancement of beneficials (hedgerows, beetle banks, flowering and grass strips)</p>	<p>Livestock production</p> <p>Diversification of local agriculture</p> <p>Market gardens</p> <p>Soil and water conservation</p> <p>Intensify agriculture based on local ecological principles</p> <p>Other activities that aim to increase or diversify food production by small-scale farmers</p>	<p>FOOD AVAIL: Indirect link to nutritional outcomes</p> <p>ENVIRONMENTAL GOODS: Key contributor to health as a major contributor to nutritional outcomes</p>
Improvements in physical capital	<ol style="list-style-type: none"> Targeted use of non-renewable inputs and technologies 	<p>New seeds, precision-farming, patch spraying, targeted inputs and slow-release for pesticides and fertilizers, low dose and non-toxic sprays, veterinary services, pheromones, sterile males, resistant crop varieties and livestock breeds, machinery, hand tools, ploughs, new cash crops including energy crops</p>	<p>Livestock</p> <p>Seed banks</p>	<p>FOOD AVAIL: Indirect link to nutritional outcomes</p>
Improvements in social capital	<ol style="list-style-type: none"> Social and participatory processes leading to group action 	<p>Social and participatory processes: farmers' research and experimentation groups, resource management and users' groups, credit groups, horizontal partnerships between external sectoral agencies.</p>		<p>SOCIAL CAPITAL: Key contributor to nutritional outcomes</p>
Improvements in human capital	<ol style="list-style-type: none"> Human capital building through training-learning programmes 	<p>Building farmers' knowledge and skills: farmer field schools for improving agro-ecological knowledge, leadership training, adult literacy classes, computer-based knowledge development, farmer-to-farmer extension, farmer experimentation programmes.</p>		<p>EDUCATION: Key contributor to nutritional outcomes</p>
Improvements in finance	<ol style="list-style-type: none"> Access to finance (credit, grants, subsidies) Add value by processing to reduce losses and increase returns Add value by direct or organized marketing of produce to consumers 	<p>Access to affordable, access to government grants and subsidies, increased return on sales of produce, attract new sources of money for natural capital (eco-tourism, hunting, carbon credits).</p> <p>Post-harvest technologies, processing primary produce before sale (dried fruit, chutney, oil press, sawmills), labeling produce for trace ability and transparency, fuel-efficient stoves.</p> <p>Rural roads and infrastructure, farmers' markets, box schemes, farm shops and direct mailing and community supported agriculture, producer groups for collective marketing, ethical trading schemes, green tourism.</p>		<p>INCOME: Indirect link to nutritional outcomes</p>

Evidence of effectiveness within a Sustainable Livelihoods perspective

This section provides a snapshot of recent and relevant literature on agriculture in the context of rural development and poverty, sustainable livelihoods, and -in broad terms- the relationship between agricultural production and nutritional outcomes. As underlined earlier, this is not an attempt at providing a comprehensive literature review but rather to flag significant, recent publications that signal today’s thinking and development trends. The first batch of literature reported here are three recent global reviews on agriculture.

Each item reviewed includes a quick reference table to signal the dimensions it addresses; the following example would report on an ideal reference covering agriculture and nutritional outcomes, with reference to the impact on the five types of assets:

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●	●	●	●	●	●	●

Global reviews

Pretty, J. and Hine, R. 2001. *Reducing Food Poverty with Sustainable Agriculture: A Summary of New Evidence*. University of Essex: UK.
www2.essex.ac.uk/ces/ResearchProgrammes/CESOccasionalPapers/SAFErepSUBHEADS.htm

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

This report claims to be “the largest known survey of worldwide sustainable agriculture”. It reports on 208 cases from 52 countries, covering 8.98 million farmers that have adopted sustainable agriculture practices and technologies on 28.92 million hectares, equivalent to 3% of the 960 million hectares of arable land and permanent crops in Africa, Asia and Latin America.

The central question that the study seeks to answer is: “The extent to which farmers can improve food production with cheap, low-cost, locally-available technologies and inputs, and whether they can do this without causing further environmental damage.” The bulk of the quantitative outcomes reported are in the agricultural (physical) dimension, yet the contributions to natural, social and human capital are well documented.

The study does make reference to nutritional outcomes, mostly in terms of increased availability of food to the households, but not in terms of nutritional outcomes (hence the lack of the ● ‘award’). The authors acknowledge the fact that more attention needs to be paid to maternal and child nutrition, and recognize the need for better female education, family health improvements, and improving the status of women, as key elements leading to improved nutritional outcomes.

The authors emphasize the importance of agricultural interventions that provide more food and fibre while regenerating natural, social and human capital. As indicated earlier, the research sought to capture how each intervention contributed to the five types of assets.

The authors conclude that sustainable agriculture successes have been founded mainly upon:

- i) appropriate technology adapted by farmers' experimentation;
- ii) a social learning and participatory approach between projects and farmers;
- iii) good linkages between projects / initiatives and external agencies, together with the existence of working partnerships between agencies;
- iv) presence of social capital at local level.

Furthermore, for sustainable agriculture to spread to larger numbers of farmers and communities, future attention needs to be paid to:

- i) ensuring the policy environment is enabling rather than disabling;
- ii) investing in infrastructure for markets, transport and communications;
- iii) ensuring government agencies in particular are supportive of local sustainable agriculture projects and initiatives;
- iv) developing social capital within rural communities and between external agencies

The research addressed nine types of interventions covering five types of assets

1. better use of locally-available natural resources
2. intensify microenvironments in farm system
3. diversity by adding new regenerative components
4. better use of non-renewable inputs and external technologies
5. social and participatory processes leading to group action
6. human capital building through continuous learning programmes
7. access to affordable finance
8. added value through processing to reduce losses and increase returns
9. adding value through direct or organized marketing to consumers

Of the nine interventions, the research clearly points toward the need for more attention on the last three pertaining to strengthening financial assets.

The authors report that the synergy among the different components is a major dividend of these interventions. For example, the combination of increased yields and community involvement are hallmarks of the *sustainable* part of these agricultural interventions:

Increasing productivity over time has been noted in fish ponds in Malawi. These are typically some 200-500 m² in size (0.02-0.05 ha). Researchers compared the performance of some 35 fish ponds over six years: in 1990 yields were 800 kg/ha, but rose steadily to 1450 kg/ha by 1996. This is because fish ponds are integrated into a farm so that they recycle wastes from other agricultural and household enterprises, leading to steadily increasing productivity over time. "As farmers gain a greater understanding of how this new system functions, and an appreciation of its potential, they become increasingly able to guide further evolution towards increasing productivity and profitability" (Brummet, 2000). But where non-participatory approaches have been used to work with farmers, yields had fallen. (par. 4.42)

The study confirms that most projects combined several interventions, yet reductionist methods of analysis do not account for these synergistic increments. This perspective is very important to highlight: it is corroborated by other literature⁵ and it is indicative of the difficulty of trying to predict outcomes. At the same time, there are encouraging examples in the literature describing the potential for participatory monitoring of the impact of sustainable agriculture initiatives, where indicators that cover multiple objectives are negotiated and agreed upon among the interested parties (Guijt, 1998).

Successful sustainable agriculture interventions may substantially improve domestic food consumption, or increase local food barter and sales through bio-intensive gardens or fish in rice fields, or better water management, without necessarily affecting the per hectare yield of cereals. The most common mechanisms were yield improvements with regenerative technologies or new seeds/breeds, with 60% of the projects, 56% of the farmers and 89% of the area⁶.

The 208 projects summarized in the report collectively work with 4.43 million farmers on 3.58 million hectares, where food production per household increased by 1.71 tonnes per year (an increase of 73%). For the 146,000 farmers on 542,000 hectares cultivating roots (potato, sweet potato and cassava), the increase in food production was 17 tonnes per year (an increase of 150%); for the larger farms in Latin America (average = 90 ha/farm), total production increased by 150 tonnes per household (an increase of 46%).

The improvements in both yields and household food production raise an important question: why have these effects not yet been seen in national statistics? The writers suggest there is significant 'elasticity of food consumption' in most rural and poor households. The 'elasticity of food consumption' refers to increased food production that is being consumed locally (either in farm households or bartered/sold into local markets), with substantial positive benefits for child and adult health (though this was not quantified). This could be in the form of more meals per day, and/or more protein, vegetables and milk in the diet.

The report concludes with the following main lessons:

- Technologies and social processes for local level sustainable agriculture are well-tested and established. The authors found that improvements in food production are occurring through one or more of five mechanisms:
 - i intensification of a single component of farm system (with little change to the rest of the farm) - such as home garden intensification with vegetables and/or tree crops, vegetables on rice bunds, and introduction of fish ponds or a dairy cow;
 - ii addition of a new productive element to a farm system, such as fish or shrimps in paddy rice, or agroforestry, which provides a boost to total farm food production and/or income, but which do not necessarily affect cereal productivity;

⁵ The authors refer to Uphoff (2000), Cornia (1995), Altieri, (1999), and Rosset, (1999).

⁶ The evidence for win-win situations is important, especially where the yield of more than one component of the farming system is enhanced, as is the case of fish-rice combinations (MacKay, 1995).

- iii. better use of natural capital to increase total farm production, especially water (by water harvesting and irrigation scheduling), and land (by reclamation of degraded land), so leading to additional new dryland crops and/or increased supply of additional water for irrigated crops (so increasing cropping intensity);
 - iv. improvements in per hectare yields of staples through introduction of new regenerative elements into farm systems (eg legumes, integrated pest management);
 - v. improvements in per hectare yields through introduction of new and locally-appropriate crop varieties and animal breeds.
- The social and institutional conditions for the spread of the technologies are less well known, but have been established in several contexts, leading to very rapid spread in the 1990s
 - The political conditions for the emergence of supportive policies are least well established, with only a very few examples of real progress.

The authors suggest the following directions: More attention is needed on: social, institutional and policy contexts, and on how different interventions affect each major kind of agro-ecosystem. The differentiated analysis of interventions the 13 major eco-systems is a theme that other major reports also highlight. The authors summarize the current situation, and the challenges for improvement that are specific to each eco-system:

- I. Wetland rice,
- II. Arid and semi-arid millet and sorghum,
- III. Rainfed maize, wheat, rice and legumes (uplands, drylands),
- IV. Wheat and maize intensive rotations,
- V. Home gardens and microenvironments (includes dairy),
- VI. Tropical roots and tubers,
- VII. Banana and plantains as staples in mixed systems,
- VIII. High mountains,
- IX. Livestock – extensive grasslands,
- X. Livestock – intensive pasture and feed-based systems,
- XI. Intensive horticulture and Orchards,
- XII. Fibre crops,
- XIII. Plantation and estate crops.

Dixon, J. Gulliver, A., and Gibbon, D. 2001. *Farming systems and poverty: Improving farmers' livelihoods in a changing world*. FAO and World Bank: Rome and Washington.

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●		●	●

This recent FAO/World Bank study addresses the question of: “What are likely to be the most successful strategies for small farmers in each system and what sort of initiatives can best help farmers to realize them?” The thrust of the research is based on the farming

systems perspective and suggests the following household strategies for hunger and poverty reduction:

- Intensification of existing patterns of farm production;
- Diversification of production, including increased market orientation and value added
- post-harvest activities;
- Increased operated farm size, either through consolidation of existing holdings or the extension of farming on new agricultural land;
- Increased off-farm income to supplement farming activities; and
- Exit from agriculture, involving migration from rural areas. (p. : 342)

The study warns, however, that each strategy needs to be adjusted for different farming system categories.

The relative importance of these poverty reduction strategies differs between system categories. In order to facilitate policy and programme formulation, the three most important poverty reduction strategies for each farming system category are shown in Table 2. In aggregate terms, a larger proportion of poverty reduction is expected from improvements on the farm (diversification, intensification and increased farm size) than from off-farm sources (increased off-farm income and exit from agriculture). In the context of farm improvement, diversification is a key strategy for poverty reduction in all eight system categories, whilst intensification is important in those systems with higher potential, notably irrigation and dualistic systems. Increased farm, herd or business size is of significance only in dualistic and urban based systems.

Table 2. Key strategies for poverty reduction by farming system category (Dixon et al., 2001)

Poverty reduction strategies	Irrigated schemes (small holder) (3)	Wetland rice based (3)	Rainfed humid (11)	Rainfed highland (10)	Rainfed dry/cold (19)	Dualistic (large/small) (16)	Coastal artisanal fishing (4)	Urban based (6)
Intensification	■ (3.4)	■ (1.7)	■ (1.9)	(0.9)	(1.5)	■ (2.8)	(0.7)	(1.3)
Diversification	■ (2.9)	■ (3.4)	■ (2.7)	■ (2.7)	■ (2.3)	■ (2.0)	■ (2.5)	■ (2.7)
Increased farm size	(1.2)	(0.9)	(1.7)	(0.6)	(0.9)	■ (2.0)	(0)	■ (1.7)
Increased off-farm income	■ (1.9)	■ (2.8)	■ (2.2)	■ (3.0)	■ (2.2)	(1.8)	■ (4.2)	■ (3.6)
Exit from agriculture	(0.6)	(1.2)	(1.4)	■ (2.8)	■ (3.1)	(1.3)	■ (2.6)	(0.8)

Seventy-two farming systems are grouped into the above eight categories (numbers appear in each system name). The scores are “derived expert judgements” about the relative importance of each strategy (they add up to ten by farming system category); the boxes flag the three top scores per category.

Millions of farmers are also expected to escape poverty by increasing off-farm income, which is second only to diversification as a key strategy for poverty reduction, in seven of the eight system categories. The exit of farmers from agriculture within a particular farming system is expected to be

an increasingly common phenomenon, and of particular importance among smallholders in low potential rainfed highland and dry/cold systems.

As indicated above, there are important complementarities between the poverty reduction strategies. In fact, many farmers simultaneously intensify and diversify their production. The intensification and diversification of farming creates the conditions for the development of the non-farm economy and the increase of off-farm income, which in turn stimulate further agricultural growth. Over time, poorer agricultural households may progressively increase the emphasis on off-farm income until they finally abandon agriculture altogether. (pp. 351-352)

The emphasis on diversification merits attention⁷. On the one hand it can refer to diversification of a farming system; on the other, it may refer to the need to sources of income. Research on rural livelihoods in sub-Saharan Africa show that often, diversification means both:

Where input credit and crop insurance markets are missing, households whose livelihoods derive from rainfed agriculture mitigate production risk by choosing risk-reducing techniques and by cultivating low-risk but low-return crops...Poor rural households also spread risk by diversifying their livelihoods away from farming, and pursuing a range of economic activities which offer variable returns that, ideally, are not closely correlated with returns to agriculture (Reardon, 1997; Ellis, 2000). (Devereux, 2001)

This study points toward the need to pay attention to production and post-production, along with farm size, off-farm income and migration, with reference to each of the farming system categories across major regions.

The study provides a useful review by region of the major farming systems and their potential with some attention to human and physical capital. A number of case studies are referred to in the report annexes. Less emphasis is placed on social capital, and the nutritional dimension is not addressed.

Other studies confirm the trend where rural people construct their livelihoods through three main strategies: agricultural intensification, livelihood diversification, and migration (Hussein & Nelson, 1998). In other words, the range of options proposed by the FAO/World Bank report are not mutually exclusive.

Uphoff, N. 2002 (in press). The agricultural development challenges we face. In: Uphoff, N. (ed). *Agroecological innovations: Increasing food production with participatory development*.

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

⁷ A review of work by Gladwin et al. (2001) (below) explores these dimensions and their complexity, with emphasis on the many income-generating activities undertaken by men and by women.

This introductory chapter summarizes a (forthcoming) book that was prepared following the 1997 Bellagio Conference on sustainable agriculture (Bellagio Conference, 1999). The authors emphasize that agroecological approaches are better understood as production systems rather than simply as technologies.

The agroecological principles needed to raise agricultural productivity in a sustainable manner are the following:

- *Biodiversity* at all levels, to maintain greater resilience and richness within ecological systems;
- *Synergy* to achieve more output from given inputs thanks to mutually reinforcing interactions among crops, soils, insects, plants, animals, microorganisms, etc.;
- *Dynamics*, recognizing and capitalizing upon the continuous change in living things and systems, such as the process of nutrient cycling;
- *Enhancement* to add to the value and productivity of resources, such as by maintaining better soil health;
- *Conservation and regeneration* to minimize losses from systems and to strengthen them according to the preceding principles; and
- *Adaptation and innovation* to meet changing conditions in the environment and devise continually new ways of solving problems. (Bellagio Conference, 1999)

This book is closer to the Pretty and Hine's report than to the FAO/World Bank one in that it emphasizes a type of agriculture that regenerates natural assets and creates opportunities in areas where high input production systems are questionable.

...there are many and growing concerns that this strategy of agricultural development ["the green revolution"] may not be the best or the only one to promote in the future since it has costs as well as benefits. Conway (1997) has framed the issue in terms of needing in the future "a doubly green revolution," one that reverses environmental deterioration at the same time that it augments the supply of food. It should also ensure that the food produced meets the nutritional, economic and social needs of the millions of persons who are hungry and malnourished, presently numbering about 800 million (Pinstrup-Andersen and Cohen 1999). The aim of the agricultural enterprise should be to produce secure and healthy people, not just food. (Uphoff, 2002)

Uphoff emphasizes that many of the agroecological practices are derived from existing farming knowledge, increasingly supported by scientific explanations⁸. "The universe of experience presented here is not one of particular technologies for selected crops but rather one applying various *principles* that can capitalize more fully on existing genetic potentials."

⁸ Ecological production systems that do not degrade the environment and seek to restore fertility to the soil are increasingly recommended. The link between food security and production practices, especially with regards to declining soil fertility is important to mention. (Sanchez & Leakey, 1997; Cassman & Harwood, 1995; Pinstrup-Andersen, et al., 1999).

The following example is provided of agroecological approaches from Yunnan province, China by Zhu et al. (2000). There, crop losses were reduced and yields were raised by intercropping rice varieties that are susceptible to blast disease with non-susceptible varieties. By varying management practices to capitalize on natural disease resistance -- at first on all the rice fields in five townships in 1998 and then in ten townships in 1999 -- blast disease was reduced by 94 percent compared to rice grown in monoculture. The yield from otherwise-susceptible rice varieties was raised by 89 percent. Reduction in disease was so successful that after two years, farmers no longer used fungicidal sprays, and in 2000, the method was being used on 40,000 hectares. (Bellagio Conference, 1999)

From a sustainable livelihoods perspective, the example shows the contribution beyond agronomic outcomes (yields): financial gains were achieved as well as environmental ones.

The book reports on several cases presented at the Bellagio Conference on Sustainable Agriculture that merit some mention; the following is a selection from the conference proceedings⁹:

Bangladesh

The Rice-Fish Program, funded by the U.K.'s Department for International Development and the European Union and administered by CARE/Bangladesh, is currently working with about 150,000 rural households to expand rice production within integrated farming systems that also practice integrated pest management (IPM) using few external inputs. The program aims to optimize the use of available natural resources through sustainable and more productive land use. By raising rice yields from 3.8 tons per hectare to 4.1 tons with 18-30 percent lower costs of production, incomes of participating farmers are 50 percent higher than those of control farmers in the area, who have similar assets but do not participate in the project. Farming results have been stabilized, with variance in production reduced by about 50 percent compared to control farmers. Raising fish in farmers' rice paddies and growing vegetable crops on paddy bunds can add up to US\$240 per hectare of income. This is twice as much income as earned from a hectare of rice production alone. These practices have been evolved and communicated through Farmer Field Schools. These schools are highly participatory in their methods, following the example of the IPM program in Indonesia, developed over the past 10 years with FAO support (Oka, 1997). The Rice-Fish Program is now scaling up to involve one million households starting next year (Dessilles, 1999). (Bellagio Conference, 1999)

Philippines

One of the main constraints on production in Southeast Asia is the extent of sloping land, with over half the land having more than 8 percent slope.

⁹ For more examples of innovative agroecological approaches from different regions of the globe, refer to pages 16-24 of the Bellagio Conference report at: www.rodaleinstitute.org/international/conference/bellagio.pdf

"Conventional" agricultural practices contribute to soil erosion (60-200 tons per hectare per year) and ensuing fertility loss. For many years, farmers were advised (admonished) to construct terraces or to plant contour hedgerows to control erosion, but these technologies were not widely adopted, in part because of their high labor requirements. In the Claveria region of northern Mindanao, there is now a simpler and cheaper technology developed by ICRAF and partners that is being widely adopted and adapted by farmers. It involves natural vegetative strips, with permanent ridge tillage, that are able to reduce soil loss almost completely. Maize yields have been increased from 1 to 2 tons per hectare to 2 to 3 tons, and research shows that the strips increase fertility over time. Some farmers are getting 12 tons of maize per hectare from two crops a year. The strips can be planted with fruit trees or other plants of economic value to further increase income. Farmers estimate that the strips increase land values by 35 to 50 percent (Garrity, 1999). It is very significant that farmers are now disseminating this technology by themselves. Over 100 farmer organizations with about 2,000 members have been formed around Claveria to promote the use of these natural vegetative strips. This is somewhat analogous to the LandCare movement in Australia. The groups undertake experimentation to evaluate alternative grasses or plants for use on the strips and establish nurseries for provision of planting materials. Local governments are now giving financial support to these organizations, which are spreading in Mindanao. (Bellagio Conference, 1999)

Livelihood strategies in lieu of the small farm focus

Special issue of *Development Policy Review* 19 (4) dedicated to: Rethinking rural development. Edited by Caroline Ashley and Simon Maxwell.

Ashley, C. ; Maxwell, S. 2001. Rethinking Rural Development. *Development Policy Review* 19 (4): 395-425

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

This article is the overview piece for this journal's special issue on rethinking rural development. A central issue of concern is the viability of the small-farm model (or narrative) and its relevance in today's context where the non-farm rural economy is seen as increasingly relevant.

Rural development has been central to the development effort, but rural poverty persists and funding is falling: a new narrative is needed. This overview article describes a Washington Consensus on Food, Agriculture and Rural Development, and summarises from the various contributions here the elements of a post-Washington Consensus. Rural areas are changing, particularly with respect to demography, diversification, and strengthening

links to national and global economies. Key issues include: agriculture as the engine of rural development; the future viability of small farms; the potential of non-farm economy; the challenges of new thinking on poverty, participation and governance; and implementation problems. The article concludes with five general principles and ten specific recommendations for the future of rural development (p. 395).

Five principles for successful rural development strategies:

- (i) recognize the great diversity of rural situations;
- (ii) respond to past and future changes in rural areas;
- (iii) be consistent with wider poverty reduction policy;
- (iv) reflect wider moves to democratic decentralization; and
- (v) make the case for the productive sectors in rural development, as a strategy to maximize growth and to reduce poverty (p. 418).

Specifics:

- (i) offer different options for peri-urban, rural and remote locations;
- (ii) favour livelihood-strengthening diversification options for multi-occupational and multi-locational households;
- (iii) accept the force of the post-Washington consensus – that market institutions need to be in place before liberalization, and that states have a key role to play, for example in supplying (national and global) public goods;
- (iv) explicitly take on inequality, in assets and incomes, with targets, timetables and concrete measures;
- (v) propose measures to counter the anti-South bias of technological change, recognizing the need for public support to research;
- (vi) demonstrate that agricultural strategies will be consistent with natural resource protection, including water management;
- (vii) recognize the importance of investment in infrastructure and human capital;
- (viii) respond to the ‘obligation’ to protect the poor, with new social protection measures, including in conflict areas, and for HIV/AIDS;
- (ix) propose pragmatic steps towards greater de-concentration and devolution; and
- (x) identify the place for agriculture and rural development in PRSPs and sector programmes (p. 419).

Ellis, F.; Biggs, S. 2001. Evolving Themes in Rural Development 1950s-2000s. *Development Policy Review* 19 (4): 437-448

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

This article –from the same journal issue- describes the major approaches across 50 years of rural development thinking with emphasis on the role and contribution of the small-farm focus. The authors emphasize the role that small-farm strategies played –along with farming

systems research- in guiding agricultural policy and interventions. The paper also highlights the contribution of process-oriented approaches wherein the authors locate the contribution of NGO as development agents. The emphasis on *process* was also emphasized by the 1999 Bellagio Conference on Agricultural Options:

A principal conclusion from the conference concerned not the technologies and productions systems examined, but rather the processes by which new agricultural practices are developed, improved and extended. These new approaches have emerged largely from experience and experimentation, much of it by farmers themselves, often stimulated by working with non-governmental organizations (NGOs), research institutions and universities. In some cases, government agencies have begun working in new, less directive and more collaborative relationships with farmers. (Bellagio Conference, 1999)

Ellis and Biggs conclude with a review of the livelihoods approach as a challenge to the farming first approach:

The livelihoods concept takes an open-ended view of the combination of assets and activities that turn out to constitute a viable livelihood strategy for the rural family. Empirical research suggests that, in reality, farming activities, on average, tend to correspond to only 40-60% of the livelihood ‘package’ put together by rural households in South Asia and sub-Saharan Africa...Nor do rural growth linkages explain the patterns of activity and income sources that correspond to the non-farm components of rural livelihoods. On the contrary, remittances and transfers are always important¹⁰, as are wages and salaries in activities that have little or nothing to do with agricultural linkages. (p. 445)

Thomson, A.M. 2001. Food security and sustainable livelihoods: The policy challenge. *Development Policy Review* 19 (4): 24-28

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
	●	●	●	●	●	●

There are new policy and governance challenges when working within the livelihoods perspective. Thomson (2001) highlights what this means in terms of food security issues:

If one analyses household food insecurity from a livelihoods perspective, then one has to adopt a multi-sectoral approach. Individuals and households adopt livelihood strategies from the whole range of possibilities open to them and do not restrict themselves to an individual sector. For rural households, the agricultural sector may be an important source of livelihood

¹⁰ A good review on the importance and value of remittances appears in Ellis (2000): pp. 67-70.

activities which also provides direct access to food, but seasonal migration, urban remittances, petty trading and tourism, for example, may be other important elements of a rural household's food security strategy. (p. 26)

While donors and NGOs can begin to adopt such approaches, the livelihoods perspective is difficult to implement within governmental systems¹¹.

Over the last few decades there have been two basic models of institutionalizing food security concerns at the national level in developing countries. The first has been to establish a food security division within a planning or policy department, or in a cross-cutting department such as the Prime Minister's Office. This has been with the intent of capturing the linkages amongst different sectors necessary to address the issue of food security comprehensively. However, these units and/or departments have generally not had staff functioning at sub-national level, and have not had operational capacity. They have been perceived as developing strategies for line ministries to implement, but generally without the budget or power to provide either incentives or penalties to encourage the ministries to comply with these strategies. (p. 26)

Thomson further argues that there are reasons to suggest that national statements on cross-cutting issues such as poverty or food security must be seen as guiding, rather than substituting, sector-specific policy making:

The second model has been to set up specialized units or divisions within line ministries, often the agricultural ministry. Here the problem has been marginalization of the food security agenda to the main sectoral concerns of the ministry concerned. In some countries there have been two or three units set up in different ministries, for example in Health, Agriculture and Social Services. These units have been intended to provide co-ordination and coherence amongst the various aspects of food security policy. However, in most cases they have either become ineffective, or have been captured by the agenda of the parent ministry. In short, even when food security is well understood as a multi-sectoral household level issue, there are strong forces which lead to it, in practice, being addressed in a single sector manner, most notably as a food production problem. (pp. 26-27)

¹¹ A further complication is the poor performance of sector-wide approaches with the agriculture sector itself; for further analysis refer to: Foster, M., Brown, A. and Naschold, F. 2001. Sector programme approaches: Will they work in agriculture? *Development Policy Review* 19 (4): 321-338

Emphasis on women’s multiple livelihood strategies

Gladwin, C.H.; Thomson, A.M.; Peterson, J.S.; Anderson, A.S. 2001. Addressing food security in Africa via multiple livelihood strategies of rural women. *Food Policy* 26: 177-207

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●			●	●	●	●

In sub-Saharan Africa: “The current thinking about food security, that it is an issue of household income and poverty and not just inadequate aggregate food production, challenges programs which encourage women to just grow more food crops to improve food security... What is needed, as a general rule, are interventions to increase women’s incomes and help make their livelihoods more sustainable.” (Gladwin, et al., 2001)

Because food security is primarily of problem of low household incomes and poverty, and not just inadequate food production, projects and programs for food insecure African farmers which aim at increasing production of subsistence crops may be ineffective. Instead, governments should look for ways to improve returns to farmers’ resources in a broader context, which may include expanding opportunities for non-farm microenterprises and agricultural labor. This has been the conventional wisdom since the writings of Amartya Sen. Still unclear, however, are the implications of his thinking for the roles of African women farmers who are traditionally the food-crop *producers* in Africa and are often food insecure. Immediate expansion of income-earning activities such as cash-cropping and non-farm microenterprises may not be possible for women in male headed households in many African societies where cash income is seen as part of the male domain. In addition, women farmers may need a long adjustment period to diversify their income sources fully because most African countries are at the early stages of structural transformation. Different developmental interventions, both in policy and in technology, are therefore needed to address food security and economic transformations in Africa in the short and long term. (Gladwin, et al., 2001)

Gladwin et al. (2001) review women’s and men’s income generating activities in Eastern Zambia and describe the multiple livelihood strategies that work for women farmers and support women’s food production (Table 3).

Table 3: Women’s and men’s income generating activities in Eastern Zambia (n=121) (Gladwin, et al., 2001)

Income generating activity	Number of women (n=81)	Number of men (n=40)
Selling crops such as cotton, maize, groundnuts, potatoes, beans, tobacco, soybeans, sunflower seeds, bananas, sugar cane or vegetables (rape, cabbage, tomatoes)	40	24
Selling cotton	36	17
Performing <i>ganyu</i> (piece work)	30	7
Gardening (bananas, sugar cane, vegetables)	23	19
Brewing beer	23	0
Selling animals (cattle, pigs, chickens, goats)	22	17
Buying and selling oil, paraffin, sugar, cigarettes, soap, or sweets	16	4
Selling buns or fritters	11	0
Regular employment such as teachers, health workers or farm laborers on large commercial farms	4	3
Remittances from children who work in town	4	1
Making pots	4	0
Exchanging maize for <i>kapenta</i> , and selling <i>kapenta</i>	3	3
Pressing sunflower seeds into oil to sell	3	3
Sewing and knitting	2	0
Being a traditional healer	1	0
Temporary work repairing feeder roads	1	0
Selling grass for thatching	1	0
Rent homes in town (if retired to village)	2	0

The authors offer data to show that while women increase production to cover household maize needs from 3 months a year to 7 using green revolution techniques, they need off-farm income to cover the cost of inputs plus the food for the other 5 months of the year. They conclude that there is a need for a 4-pronged strategy:

1. encourage women’s income generating activities and multiple livelihood strategies
2. complement (1) with agricultural research programs aimed at increasing women’s returns to their land
3. realize rural women are not a homogeneous group, and more than one “best-bet” recommendation may be needed, and
4. in the short run, provide the poorest women farmers with productivity-enhancing safety nets, or PES-nets to address food consumption deficits.

Targeted food aid interventions may fit well as part of the fourth strategy, especially as it is understood as a means of avoiding the need by the poorest households to liquidate productive assets, consume seed or incur further debt (Clark & Taylor, 2001). Food aid also tends to be more effective when it is: controlled by women, integrated into local planning and community organizing, and perceived as a tangible resource that enables households to overcome chronic food deficit periods.

Special issue of *Agriculture and Human Values* (Spring, 2001) Vol. 18 dedicated to: Gender and resource management: Households and groups, strategies and transitions.

Valdivia, C. 2001. Gender, livestock assets, resource management, and food security: Lessons from the SR-CRP. *Agriculture and Human Values* 18: 27-39

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

This research is based on the Small Ruminant Collaborative Research Support Program (SR-CRSP) that included research sites in Indonesia, Peru, and Kenya. The research focused on the relationship between gender, resource management, and the ability to build livestock assets and security, in different household production systems:

Small ruminants under the domain of women, either through production or marketing, are shown to contribute to in-kind consumption or, as liquid assets, to household welfare purchases, in the case of Andean agropastoral households and households in Kenya. (Valdivia, 2001)

The SR-CRSP components are summarized in Table 4.

Table 4. SR-CRSP components from 1980 through 1996 in selected countries

Country	Research component	Production system	Objective	Approach
Indonesia (I 1981-1995)	I. High prolific sheep II. Hair sheep production systems	I. Crop-livestock systems II. Rubber and sheep systems	I. Income growth II. Sheep production under rubber plantations	I. On station research and pilot II. Testing on-farm
Peru (1980-1989)	I. Breeding nutrition range and health II. Community systems project	I. Pastoral systems II. Agropastoral systems	I. Increasing productivity in sheep and camelids II. Peasant welfare	I. Disciplinary on-station and on-farm research II. Systems research
Kenya (1980-1997)	I. Kenya dual purpose goats II. Animal health	I. Crop-livestock systems II. Agropastoral systems	I. Milk and meat increase in small holder farms II. Vaccines	I. Disciplinary and systems research II. Biotech
Bolivia (1991-1995)	Sustainable agropastoral systems on marginal lands	Agropastoral semi arid high-lands	Sustainable yields, understand the role of livestock	Systems research with social sciences, range ecology and animal nutrition

The author emphasizes the role of livestock in supporting women-controlled aspects of agriculture, the ‘women’s sub-economy’ that exhibits a tighter link to food security than non-gender differentiated approaches.

The review of the SR-CRSP research shows that small ruminants contribute to the diversified economic portfolio of peasant household production systems. Women have been identified as the major managers of small ruminants in most production systems, and managers of related inputs. The findings reveal diversity in women's roles in the management of small ruminants, resulting from interactions between gender, class, ethnicity, social factors, and market and macroeconomic conditions. Economic changes facing developing countries intersect with gender in outcomes that are not deterministic. Women can gain or lose from these interactions. Asset access and ownership allow them to gain from these negotiations, improving their welfare expenditures. This asset in the hands of women resulted in greater welfare expenditures. Therefore, access, control, and management of resources, such as small ruminants, grazing areas, and feed resources, provide assets that improve equality and empowerment.

In the context of food insecurity, focusing on interventions that benefit women's sub-economy can positively impact food security. Once this condition is met, individuals and households will be in a better position to negotiate a transition to improved welfare through growth. Empowering food providers, we propose, will allow them to negotiate to their advantage. (Valdivia, 2001)

The article does not go beyond a general reference to food security, and specific nutritional indicators are not mentioned.

Flora, C.B. 2001. Access and control of resources: Lessons from the SANREM CRSP. Valdivia, V. and Gilles, J. 2001. Gender and resource management: Households and groups, strategies and transitions. *Agriculture and Human Values* 18: 41-48

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●	●	●

This article provides a good review of the different types of capital, with some variation over the SL-framework. It is one of the few that addresses the different types of assets with emphasis on women and natural resource management, and the consequences of emphasizing only one form of capital.

For example, in the Philippine site (Lantapan in Mindinao), we found that focusing on increasing short term financial gains through growing tomatoes for export to Manila reduced the value of human capital through negative impacts on environmental capital (increasing pesticides in the water and increased soil erosion), on human capital through increased incidence of disease and chronic illness, and on social capital (through bypassing local

marketing networks and replacing them with impersonal corporate structures). (Flora, 2001)¹²

One important contribution is the emphasis on women’s participation and status; in other words, it refers to a key factor that enhance nutritional outcomes:

The superstructure that relegates women's voices to background noise must be seriously addressed. This occurs through implementing policies that do not disadvantage women, and through fostering the creation and strengthening of women's participation in groups - formal and informal - that allow them to collectively leverage the various forms of capital inside and outside their community. In the SANREM CRSP, we found that by establishing venues where they could seriously address questions of sustainability based on the resources to which they had access, real changes occurred in both the efficiency and the equity of the activities carried out. (Flora, 2001)

Linking agricultural commercialization with income and nutrition

Von Braun, J. 1995. Agricultural commercialization: impacts on income and nutrition and implications for policy. *Food Policy* 20 (3): 187-202

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●	●		●			●

This article explores the driving forces behind increasing commercialization of subsistence agriculture, the process by which increasing commercialization affects income, and nutrition, and it concludes with some policy considerations to cope with negative impacts and foster increases in income and nutrition during commercialization transition processes. The article reports on much of the material from an earlier book by the same author (von Braun & Kennedy, 1994).

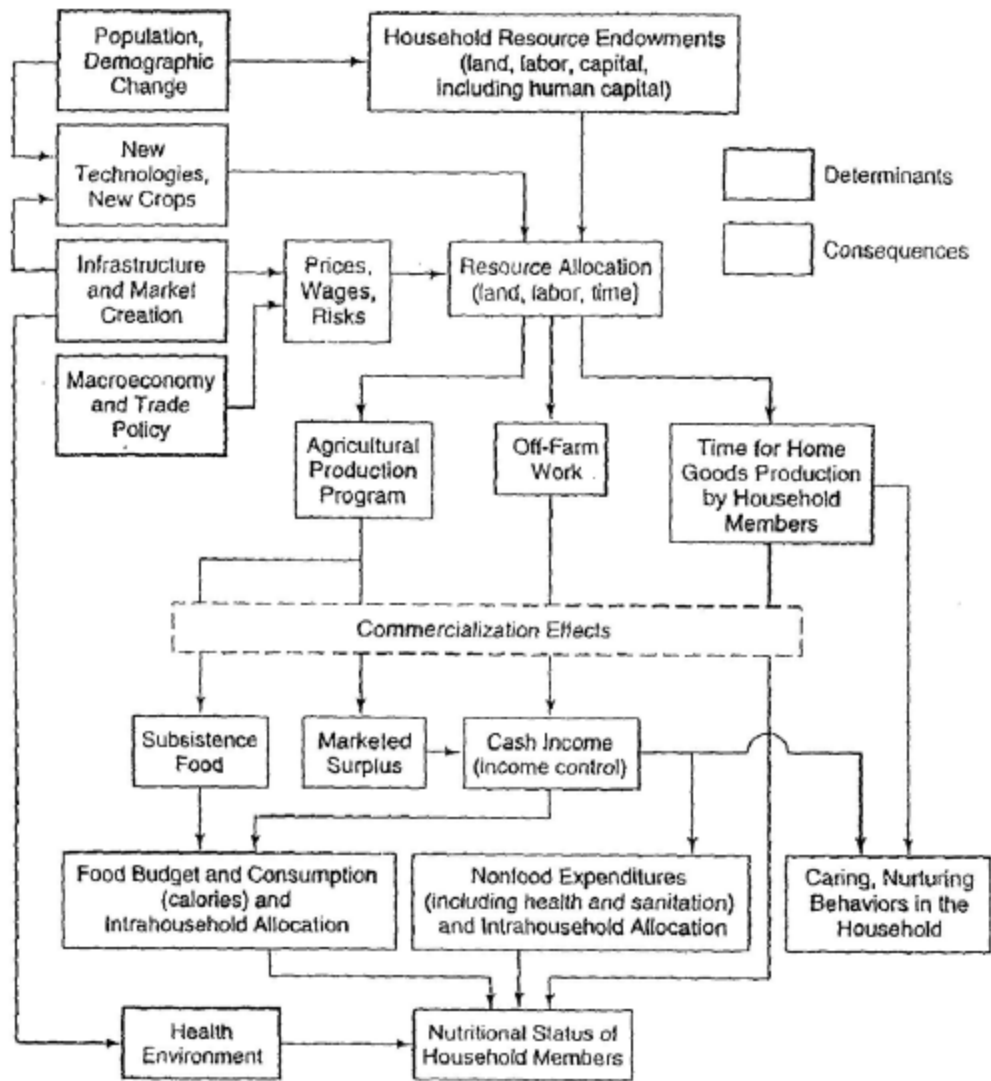
Von Braun differentiates between *exogenous determinants* (population and demographic change; new technologies and new crops; infrastructure and market creation; macroeconomy and trade policy) and *consequences* for income and nutrition at the household level. For the purposes of this study, the causal relationships portrayed between agricultural production and food budget and consumption at the household level are clarified in a diagram that is reminiscent of IFPRI’s (see Figure 8)

The availability of new technologies, such as improved seeds and agronomic practices, and investment in infrastructure and policies for market creation, are key factors that facilitate the commercialization process... *Technological change* implies increased factor productivity. *Commercialization* implies increased market transactions for capturing the gains from *specialization*.

¹² The third example in Annex 2 (growing vegetables in Guatemala for the US market) may resemble this situation.

Ideally, policies to speed up commercialization and technological change move jointly in a reinforcing way... The endogenous consequences of commercialization for consumption and nutrition relate to decision making within households. One set of decisions affects the allocation of income for food and nonfood consumption. Another set concerns how the available food and other consumption items are distributed among household members and how household members spend their time, which may change under commercialization as the value of time and decision making power may be affected by commercialization... Finally, caring or nurturing activities within the household may be critically important in translating commercialization effects into child health impacts. (von Braun, 1995)

Figure 8: Commercialization at the household level: determinants and consequences for income and nutrition (von Braun, 1995)



In other words, in the context of this study, for an agricultural intervention to contribute towards household budget and consumption goals, a number of variables intervene, namely off farm work (often associated with some sort of migration) and commercialization decisions. The importance of wage labour and remittances as expected contributors to household income –in addition to crop production- is reported elsewhere (Kaiser & Dewey, 1991).

Von Braun reviews a number of case studies from different countries to analyze the impact of commercialization (Figure 9).

Figure 9: Overview for case study settings of commercialization features, and income and nutrition effects (von Braun, 1995).

Country	Commercialization scheme	Main subsistence crops/commercial crops	Did income increase?	Was there a favorable effect on nutrition?
Malawi	Commercialization of maize and tobacco	Maize, legumes/ maize, tobacco	Yes, but with wide variations	Not much. There was no significant difference in nutritional status between children of tobacco growers and of non tobacco households
Sierra Leone	Bo-Pujehun Rural Development Project-Tree Crop Promotion	Upland rice, vegetables, roots/coffee, cocoa, oil palm	No, in fact it was about 12 percent lower among new adopters, and about the same for established plantation farmers and subsistence farmers	No, children of commercialized farmers seem worse off than children of subsistence farmers
The Gambia	Jahally-Pacharr Smallholder Rice Project	Millet, sorghum, rice/rice under modern irrigation, groundnuts	Yes, for households as a whole, but women generally benefitted less than men	Yes, especially for those children who were in a particularly bad nutritional situation

Country	Commercialization scheme	Main subsistence crops/commercial crops	Did income increase?	Was there a favorable effect on nutrition?
Guatemala	Export vegetable-producing cooperative of Cuatro Pinos	Maize, beans/snow peas, cauliflower	Yes, substantially, especially among recent participants and smallest farmers	Not much. The prevalence of weight deficiency and stunting was slightly less
Philippines	Bukidnon Sugar Company	Maize/sugarcane	Yes, substantially, except for laborers	No, these children are more stunted and experience diarrhea and fever more frequently
Papua New Guinea	Karimui Spice Company cardamon plantation	Root crops, sago, bananas/ cardamon	No, total income similar in wage and nonwage households	Yes, generally, but those children whose mothers worked at the KSC did not fare as well as other Karimui children
India	Karnataka Dairy Development Project	Various staple foods and traditional cattle/milk	Yes, to some extent. Average expenditures up by 8 percent in villages with dairy co-ops	Information was not available
Kenya	South Nyanza Sugar Company	Maize/sugarcane	Yes, significantly, for both new entrants and sugar farmers	No difference in the prevalence of stunting, wasting, or weight-for-age
Rwanda	Potato production in the Gishwati forest area	Peas, beans, sweet potatoes, maize, sorghum/ potatoes, tea	Yes, but income control within the household affected as men's greater participation in potato production leads to their greater control over that output	Yes, the prevalence of malnutrition was lowered in households
Zambia	Technological change in maize	Maize, sorghum, finger millet/ hybrid maize	Yes, significantly. Per capita income about 25 percent higher in adopting households	Yes, for the children under 5 years, who do better with respect to the short-term weight-related measures

The following is a summary of key findings from the case studies:

Adoption of new crops and practices for commercialization

- A key question is how the implementation of the commercialization schemes and participation in the schemes affected staple food production. It was found that despite the allocation of land and labour to cash crops, per capital staple food production was maintained at high levels among the participating groups.
- Farmers are willing to pay a price to maintain household food security based on their own production, as an insurance approach. The amount of income lost to this insurance is expected to diminish as higher payoffs –in the form of higher returns to land and labour- are realized from the new crops and practices.

Employment and gender effects

- As assessment of the income and employment benefits of commercialization of agriculture is not complete if only the farm household situation is assessed.
- From a gender perspective, the findings across the case studies show that women are less involved with the new practices and remain involved in subsistence crop activities. Cash-intensive new technologies become largely men's crops.

Income effects

- The commercialization cases reported have directly generated employment or increased agricultural labour productivity. In all but two cases, total per capita income was higher among participant households. However, the relative differences were much less significant than what was expected: the share in total income of earning from crop sales by participants ranged between 11 and 35 percent.
- In five of the studies the participants emerged with income increases of 17-25%. **The proxy for permanent household income was the total expenditure, including value of home-produced food.**
- The change in *agricultural income* due to the commercialization interventions, however, is much greater than the *overall income*, because farm households depend on a wide range of multiple income sources, both farm and non-farm, and this applies to all the study settings. Off farm non-agricultural employment in all setting was significant, ranging from 20 to 60% of total household income.

Commercialization and food security

- Most smallholders strive to maintain subsistence food production along with new commercial production. This insurance practice is prevalent, despite the higher return to land and labour from cash crops. The higher the transaction costs in food markets, and the closer the households are to food insecurity, the stronger the preference for this risk avoiding practice.
- Given the shaky economic environments, maintaining own food supplies is seen by the author as an economically rational practice. Von Braun concludes that policy should respond by promoting technological change in stable (subsistence) crops, (a conclusion that is shared by the Pretty and Hine report).
- Joachim von Braun cautions that the effects of cash-crops is positive on children's nutrition but not statistically significant. He emphasizes that the important point is

that there is hardly any evidence that there is an adverse effect on child nutrition from increased commercialization even when income is held constant.

Beyond agriculture

- To enhanced the social welfare of commercialization, von Braun talks about the need to establish rural banking facilities at the grass-roots level, community health services. The latter is critical as “...the net nutritional effect of incremental income is modest since the increased income does not, at least in the short term, decrease morbidity.” (p. 201)

This article echoes other literature on the role of agriculture, rural poverty and food insecurity where the emphasis is placed on increasing household income:

It is useful to note that very few countries in the world have solved the problem of rural poverty and food insecurity in agriculture. Increasing agricultural productivity can help, but it is not sufficient. It is necessary to augment farm income from non-farm sources either through part-time or full-time employment outside agriculture. Part of this can be in industries that supply inputs to farmers or add value to the raw products of the land. However, part of it needs to be in completely unrelated activity. (Thompson, 1999)

Agricultural productivity remains important nonetheless. However, it is ironic that when technological innovation in agriculture is successful, it contributes to society by increasing food supplies at lower prices and by contributing labour to non-agricultural sectors; in other words, the benefits may not be captured by agricultural households (Mundlak, 1999).

SIGNIFICANCE

The review by Pretty and Hine demonstrates the need for more attention to the financial dimension of sustainable agriculture projects. The commercialization framework provided by von Braun sheds light on the variables that require attention. In addition, the proposed proxy for permanent household income (total expenditure including value of home-produced food) provides us with one tangible indicator to use to assess the impact of SA interventions. In this light, household income will be the result of other variables that include household food production, purchase of food and other goods, and employment income. The work by Dixon et al., 2001 emphasizes the fact that the potential of different livelihood strategies needs to be discussed within specific agro-ecologies.

Conclusions

A Roadmap to tie it all together

- Rural households, especially those located in rainfed agroecosystems, diversify their sources of livelihood to minimize risk and maximize food security. Agricultural production is only one of the contributing sources of income. Example: data from one study indicated that non-agricultural activities contribute anywhere between 20-60% of the income (von Braun, 1995).
- A Sustainable Livelihoods perspective builds on this reality and seeks to develop strategies that enhance the five types of assets that households exploit. The enhancement of social capital (example: women's status) and human capital (example: women's literacy) are key contributors towards food security and reflect some of the key determinants to achieve nutritional outcomes.
- Agricultural interventions that only aim to enhance natural capital (increase yields) and financial capital (increase household income) may not necessarily yield food secure situations. Example: Guatemalan horticultural crops for export have led to increases in household income (Dixon, et al., 2001), but in the long run their viability is subject to international market fluctuations (Waltner-Toews & Lang, 2000). Furthermore, foreign markets will impose crop preferences that will likely not include the type and variety of foods that local households require for a balanced diet across time.
- *Sustainable* agriculture (SA) interventions aim to enhance the five types of capital assets. Moreover, the combination of improvements has synergistic effects: introducing new technology (physical capital) through a participatory approach (social and human capital) yields production systems *and* people able to problem solve as conditions change. The positive impact of SA has been documented in a range of conditions (Uphoff, 2002; Pretty & Hine, 2001), yet its full potential is limited by several factors, of which institutional capacity and policies are most notable (Pretty & Hine, 2001).
- The Sustainable Livelihoods approach offers the analytical framework and sustainable agriculture (SA) the tools and experience to link agricultural interventions with food security objectives. The contribution of SA fits nicely with the notion of supporting diversified livelihoods. There is evidence that SA improves productivity, but there is more work to be done to ensure that those gains are translated into increased household income.
- The variables that affect the relationship between agricultural interventions and household income, budgetary decisions and migration decisions are described in models of commercialization (von Braun, 1995) and food security (Hoddinott, 1999). In a nutshell, the variables have to do with how much subsistence production is consumed, traded or marketed; how much land is dedicated to produce goods for

the market or for subsistence production; and how much household labour is used on-farm or migrates in search of off-farm employment. A proxy for permanent household income is the total expenditure, including value of home-produced food. The worldwide experience with SA indicates the need to bring more strategic financial and economic analyses into SA interventions.

- The challenge now is to acknowledge *conceptually* the fact that multiple livelihoods, and hence disciplines, are part of household food security; and *operationally*, that appraisal and operational approaches used by aid agencies may need to be reviewed to ensure that they respond to a broader livelihoods perspective where agriculture is not the only area of intervention.
- The SL perspective is another step in fine-tuning development policy and practice. The frameworks are being adapted by different agencies to suit their purposes. Much of this work is incipient, yet it promises to provide us with a more grounded strategy to of supporting the livelihoods of rural households.

Three basic conclusions

- The effectiveness of agricultural interventions is best appraised within a sustainable livelihoods framework. The type of agricultural strategy that holds promise as a poverty alleviation tool is one that addresses the five types of assets that households depend on.
- Agriculture is only part of rural household income diversification strategies. Rural households diversify their income sources and agricultural production is only one of their strategies. The relative potential of agricultural-related activities will depend on several variables, and the type of agro-ecology is one of the major determinants.
- Women are a key link between agricultural interventions and food security.

The effectiveness of agricultural interventions is best appraised within a sustainable livelihoods framework

The review by Pretty and Hine of 208 sustainable agriculture experiences demonstrate improvements in food production at the household level with the provision of more diverse products and across longer periods of time. The bulk of those experiences contributed to more than one of the five types of assets on which rural households food security depends:

- 92% of all projects focused on building human capital (Type 6) and 88% on making better use of existing natural capital (Type 1);
- 55% of projects focused on building social capital through participatory processes and group formation (Type 5), and 59% on introducing new regenerative components into farm systems to improve and diversify natural capital (Type 3);
- 21% focused on intensifying a single component of the farm system for production improvements (eg kitchen and bio-intensive gardens, double-dug beds, fish ponds)(Type 2);

- 18% focused on more targeted and precise use of pesticides and fertilizers for improvements (Type 4);
- 17% included a microfinance element through savings and credit groups (Type 7);
- only 12-15% of projects were specifically concerned with adding value, either by processing or protection to reduce losses, or by direct and/or organized marketing of produce (Types 8 and 9)

The *reasons for success* have to do mostly with the participatory approach encouraging the spread of processes/methods (the social learning dimension), and with external linkages and support, namely through NGO funding, support and training.

The *primary constraints* identified are a lack of appropriate policies, external linkages or support, which signal the urgent need for government support for sustainable agriculture funding.

The evidence suggests that most agricultural interventions in the past were designed to contribute towards increasing food availability (natural capital); and that those that provided technology appropriate to the ecosystem tended to maintain and increase yields when they engaged farmers in the process of innovation (human capital), contributed to women's status when the selectively targeted interventions that women could control, and enhanced linkages among organizations that support rural development (social capital).

The conclusion from Pretty and Hine is that further attention is needed on the following Types of interventions:

- Social and participatory processes leading to group action
- Human capital building through training-learning programmes
- Access to finance (credit, grants, subsidies)
- Add value by processing to reduce losses and increase returns
- Add value by direct or organized marketing of produce to consumers

This does not mean that the types of interventions originally highlighted for analysis in this study are irrelevant (livestock production, diversification of local agriculture, market gardens, soil and water conservation techniques, intensifying agriculture based on local ecological principles, seed banks, other activities that aim to increase or diversify food production by small-scale farmers). On the contrary, they are strategic types of interventions that contribute primarily towards improvements in natural and physical capital, but they need to be complemented with the above interventions. Moreover, they may have additional synergistic contributions (example: livestock manure may be a key input towards enhanced soil fertility, leading to better moisture retention and over time to more stable yields).

The worldwide publications agricultural referred to (Pretty and Hine, 2001; Dixon et al., 2001, and Uphoff, 2002a) advocate for further attention to nutritional outcomes. To bring the food and nutrition perspectives together, some writers talk about a food systems paradigm (Welch & Graham, 1999). This paper argues that the Sustainable Livelihoods framework may lead us into one such paradigm. The Sustainable Livelihoods framework sets out new challenges in the appraisal of needs and design of development interventions.

Agriculture is only part of rural household income diversification strategies

The frameworks presented by von Braun (1995) and Hoddinott (1999) help us understand the relationship between agricultural interventions and household income. The decisions rural households make with regards to adopting new agricultural technologies and practices while keeping subsistence activities in place, are influenced by numerous factors including commodity prices, market development, labour markets, perceived risk, and economic returns to land and labour. These variables include those outcomes originally defined as the focus of this study: household access to food, distress sales, and seasonal migration. In other words, such decisions have to do with how much of the household natural and human capital is kept, bartered, sold and bought. The data presented by von Braun (1995), Ellis (2000), Gladwin et al. (2001), and others emphasizes the need to address multiple household income generating strategies as the entry point, rather than agricultural interventions *per se*.

Ellis (2000) and others emphasize that the livelihoods approach requires attention to assets, access and activities. A key theme is *diversification*, and in turn, livelihood diversification can be analyzed through several dimensions: extent of diversification, poverty and income distribution, agriculture, environment, gender, and macro policies and reform. Diversification, as such can have positive effects: it takes advantage of seasonal variation in labour requirements, and can lead to risk reduction, higher income, asset improvement, and environmental improvement. Conversely, it can have disadvantages in terms of income distribution, farm output, and adverse gender effects.

In pursuing livelihood strategies, both assets and the uses to which they can be put are mediated by social factors (social relations, institutions, organizations), by exogenous trends (principally economic trends), and by shocks (personal misfortune, drought, disease, floods, pests). The framework provides a checklist by which constraints on livelihood success can be prioritized for action to remove them, and the links between them identified.
(Ellis, 2000)

Women are a key link between agricultural interventions and food security

Valdivia (2001) and Flora (2001) document how agricultural practices and decisions that are controlled by women and contribute to strategically to support their social and human capital. In parallel, the nutrition literature emphasizes the importance of women's status and education as a main contributor to nutritional outcomes. Women therefore are a key link between agricultural interventions and food security. Moreover, they tend to be more diversified in their strategies to improve household income (Gladwin et al., 2001). In addition, von Braun (1995) highlights the fact that cash-crops for commercialization are often controlled by men, and contribute only a portion of household income.

Key issues to address

The literature reviewed suggests that following:

- Those agricultural interventions that contribute towards the five types of capital are more likely to contribute towards food security in that women's status and education are part of social and human capital, and a regenerated natural capital is a contributor to healthy environments.
- Households facing the risks associated with rainfed agriculture tend to diversify their sources of income, and that often includes off-farm activities; an emphasis on livelihood strategies begins to address this fact.
- Agricultural development strategies need to become more agroecozone-specific and address multiple livelihood strategies that households employ to increase income.
- Recent studies on sustainable agriculture have yet to address nutritional outcomes within the five types of capital, yet they all signal the need to begin doing this systematically.

The above conclusions signal the need to begin thinking about *agriculture and food security* in a different light. Some of the key issues and literature to explore are:

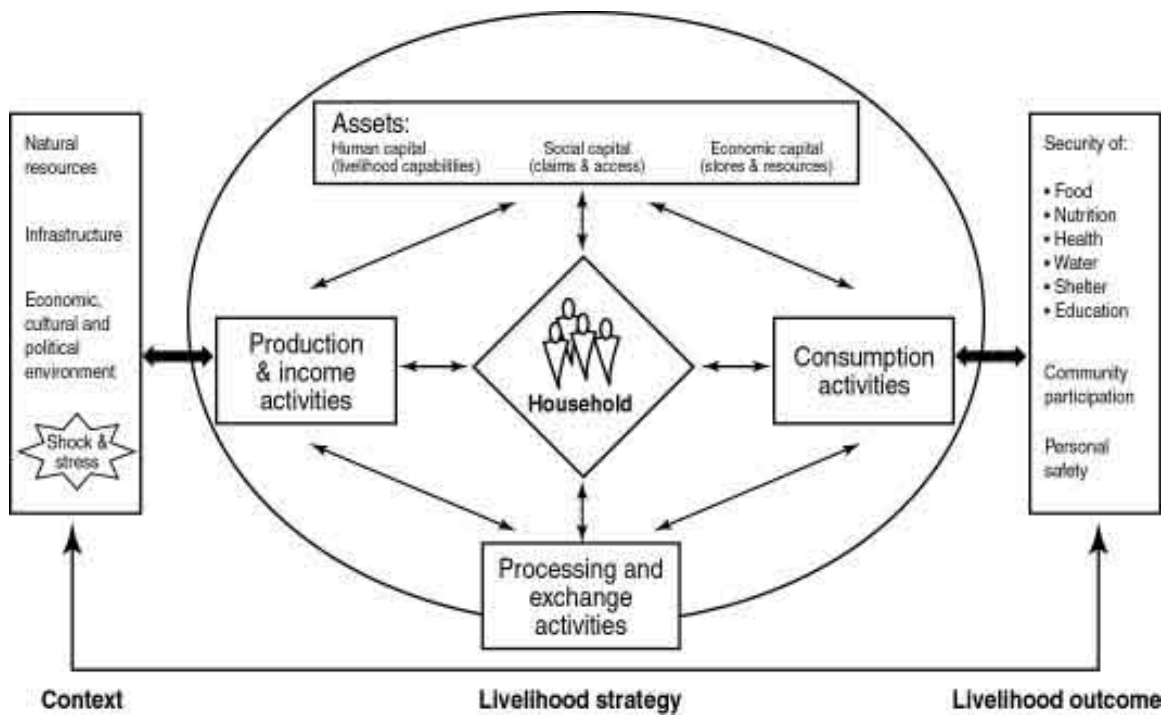
- Appreciation of multiple livelihoods and diversification strategies (Carswell, et al., 1999; Ellis, 2000; Hussein & Nelson, 1998; Gladwin, et al., 2001), in lieu of a focus on the small farm focus *per se* (Ellis & Biggs, 2001). In this context, the strategies proposed by Pretty and Hine Vs those proposed in the FAO/World Bank may actually be seen as fitting along a continuum, with emphasis on on-farm income opportunities in some contexts, and more attention to off-farm income in other circumstances.
- Appreciating how agriculture and other rural activities are interwoven into diversified income streams, namely the integration of agricultural, livestock and forest incomes (Sunderlin, 1997; Raintree & Soydara, 2001) and risk mitigation (Devereux, 2001)
- Addressing agriculture as part of livelihood strategies: some argue that agriculture is no longer *the* key engine of rural growth (Ashley & Maxwell, 2001), while others argue that it remains the best option in that a 1% increase in yields is associated with a 0.12% increase in the Human Development Index (Irz, et al., 2001)
- Understanding and assessment of nutritional outcomes (Wolfe & Frongillo Jr., 2000) as part of the appraisal of agricultural interventions, which in turn calls for special attention to household dynamics and gender (Gladwin, et al., 2001; Valdivia, 2001; Flora, 2001) and to participatory adaptive research (Sutherland, et al., 1999a) and participatory assessment (Guijt, 1998)
- Differentiating between the needs of commercial farmers Vs those of subsistence farmers with emphasis on agricultural interventions that regenerate different assets (Tripp, 2001; Uphoff, 2002; Pretty & Hine, 2001; Gladwin, et al., 2001)

- Addressing interventions in a location and agroecologically-specific manner (Uphoff, 2002; Pretty & Hine, 2001; Dixon, et al., 2001) which includes a differentiation between urban, peri-urban and remote settings (Wiggins & Proctor, 2001)
- Testing and integrating approaches that seek to enhance as many assets as possible (Rajbhandari, 2001)

Next steps scenarios

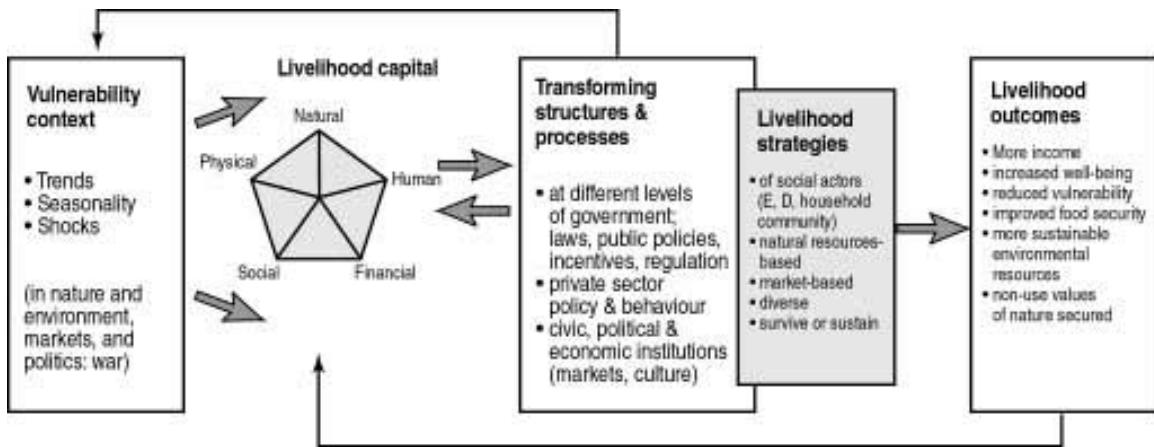
A significant shift has taken place since the start of this research: a shift from an agronomic frame of reference within the initial framework, to an exploration of the Sustainable Livelihoods framework. A major consideration in reviewing the literature has been to ensure that this proposed shift is a true reflection of development thinking. There is growing evidence that the Sustainable Livelihoods approach has potential, yet this report only begins to address how this is taking place and its full implications for the partners in this study. It is safe to say, however, that there is growing evidence in the literature that can serve as a guide for Phase 2 of this work. The figures below show the Sustainable Livelihoods approaches already developed by CARE, Oxfam and UNDP.

Figure 10. CARE’s livelihood model



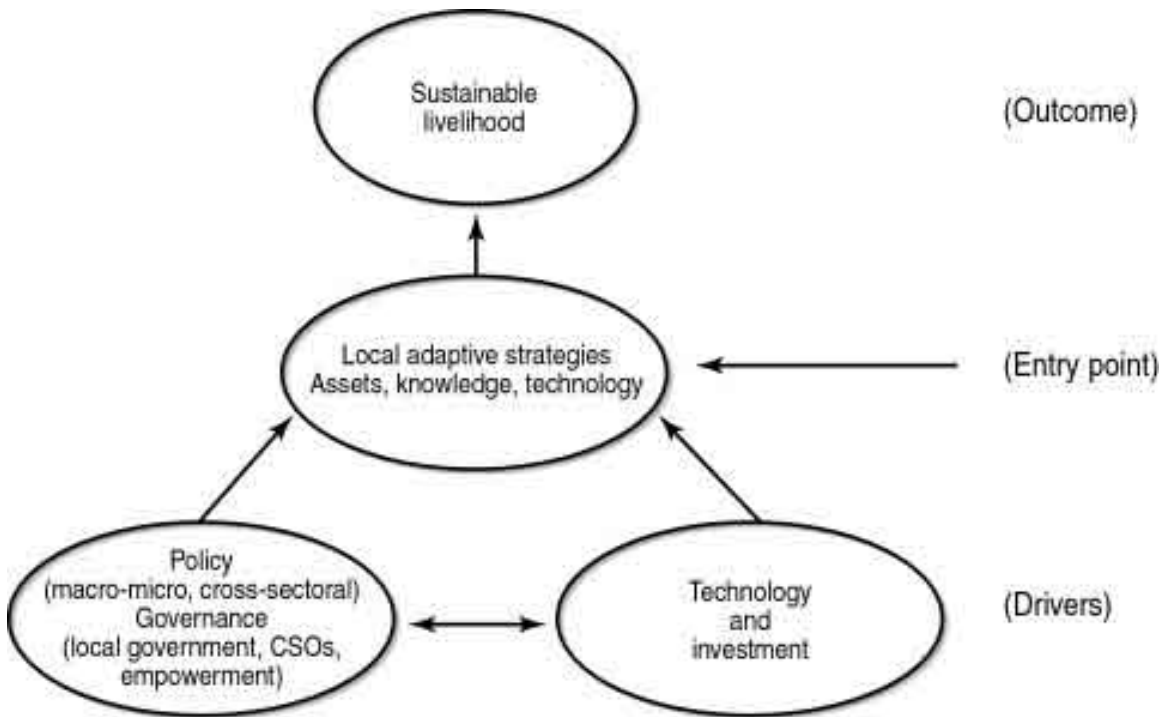
Source : (Carney, et al., 1999)

Figure 11. Oxfam’s SL Framework



Source : (Carney, et al., 1999)

Figure 12. UNDP’s SL approach



Source: (Carney, et al., 1999)

Donors and development agencies alike are taking the basic SL framework and adapting it to suit their work (as it was meant to be used). There is scope for the development of a Canadian SL approach, especially one that helps bring agricultural development and nutritional outcomes closer together. The resources to help operationalize the approach are beginning to emerge:

- The proceedings of the FAO E-Conference and forum on “Operationalizing Participatory Ways of Applying a Sustainable Livelihoods Approach” (2000) includes many relevant materials: http://www.fao.org/sd/2001/pe0903_en.htm
- Annex 4 includes an internal announcement at FAO for the launch of the Livelihood Support Programme as a strategic framework for the period 2000-2015 with US\$7 million support from DFID.
- UNDP’s website on Sustainable Livelihoods
http://www.undp.org/sl/Site_Map/Site_Map.htm
- DFID’s livelihoods website:
<http://www.livelihoods.org> which includes case studies currently underway:
<http://www.livelihoods.org/lessons/lessons.html>
- Publications like Frank Ellis’ (2000) book “Rural livelihoods and diversity in developing countries” merit close attention. In addition, there are regional and county analyses that are framed within this approach and demonstrate its potential (Carswell, et al., 1999).

The literature cited here clearly points out that this is a development theme (fashion?) that offers opportunities that may help develop the bridge between agriculture and access to food that we set out to build. The key issues to address (described above) will be difficult to embrace in the absence of a framework that helps all parties locate their perspective and areas of emphasis. The February meeting may need to focus first and foremost on reaching an agreement about the need for a SL-based framework, before attempting to cover all the key issues suggested in this report. Specific questions to address may include:

- What are the strengths, weaknesses and opportunities of the SL approach?
- What is required for projects to support households’ multiple livelihoods *in lieu* of emphasizing agricultural interventions?
- Who is involved in appraising and defining indicators to measure change in SL interventions?
- How do projects address action at the household, community and regional/national level?
- What experience do we have in enhancing financial assets within SA interventions?
- What are the different livelihood strategies that respond to the major agro-ecological zones?
- Do the above questions help us build a framework for case study development?

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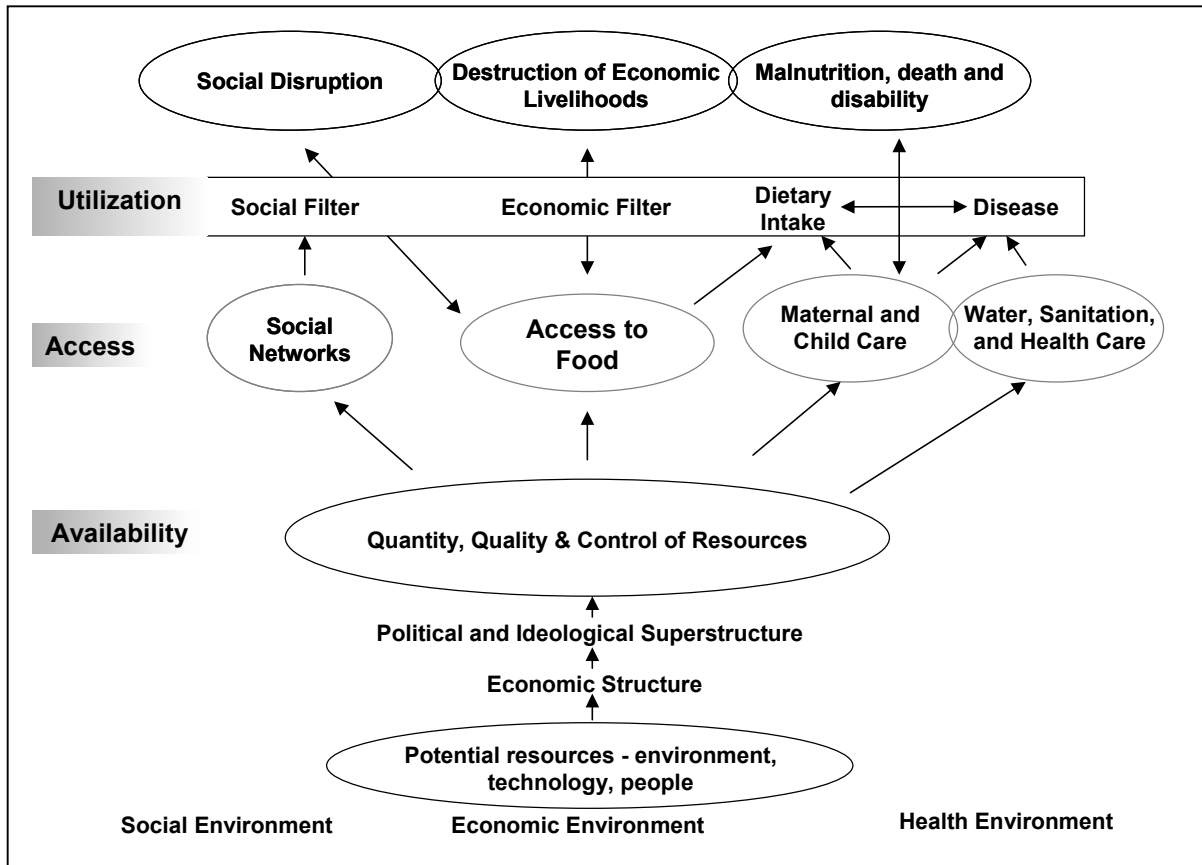
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Annexes

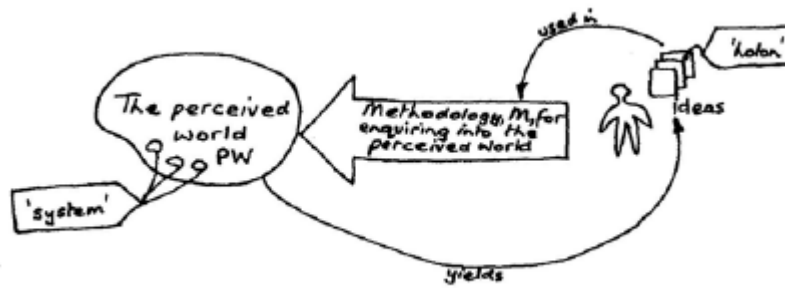
Annex 1: Conceptual framework for food security, its causes and consequences



Source: Effectiveness of Food Security Interventions: Reviewing the Evidence. Food Security Workshop Proceedings, Ottawa, March 5-6, 2001.

Annex 2: A note about soft systems methodology

Soft systems thinking assumes that people create 'methodology' for inquiring about a perceived complex situation. The 'methodology' is understood as part of a stock of ideas by means of which we interpret the world around us. We perceive the world through the filter of ideas internal to us, but the source of many of those ideas is the world outside. "When the Spanish conquistadores arrived in what is now Mexico, the indigenous people, unfamiliar with horse riding and seeing riders dismount horses, thought that the creatures had arrived that could divide themselves in two at will." (Checkland and Scholes, 1990: 19) These writers explain this notion through a diagram that illustrates our mental process: ideas (x) are used in some methodology (m) to interpret a perceived reality. In fact, treating reality 'as if it were a system' in itself constitutes an idea (x). In this paper, the conceptual framework can be understood as methodology, in that it serves as a model to talk *about* reality, and not as a model *of* reality.



Annex 3: Sample tables to respond to original TORs

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●			●

Livestock	Increased household access to food	Increased household income	Decreased distress sales of household assets	Decrease in seasonal migration
Crop-animal systems in Asia: socio-economic benefits and impacts on rural livelihoods (Paris, 2002)	Gains reported for food crop yields, cattle, soil status, and firewood.	Positive farm income increases are reported (30-75% higher) but it is not clear how cost calculations were done from forage crops returns; Income data not consistent across different examples (net farm income as returns above variable costs, net cash benefit, total gross profits).		

(a) EFFECTIVENESS OF INTERVENTION: The study reports on nine different types of crop-animal interactions and analyses them in terms of biological/technical feasibility, economic viability, and environmental soundness and social/cultural acceptability.

(b) FACTORS AFFECTING SUCCESS: role of women was enhanced (key variable for nutritional outcomes. Importance of marketing is highlighted).

(c) GAPS IN KNOWLEDGE: Paucity of information in the literature on the socio-economic benefits of crop-animal interactions (South Asia) attributed to: 1. lack of skilled social scientists within the NARS, 2. an inadequate understanding of methodologies for crop-animal research, 3. a limited knowledge of the applications of economic analysis for crop-animal interactions, 4. *an over-emphasis on component technologies* [my emphasis], 5. *a lack of concern for gender and other socio-cultural implications in technology development and dissemination* [my emphasis]. 6. poor linkages between farmers, researchers, extension workers and rural development planners [concur with conclusions by Pretty and Hine, 2001], 7. a lack of village-level support mechanisms to sustain the adoption of new technologies.

(d) INDICATORS: The livestock literature often includes articles that refer to crop-animal systems; the range of indicators is large and the unit/scale of analysis varies.

Other intervening variables:

- There are different ways of measuring income (net profit, net return, return on investment); hence it is not always possible to segregate livestock from crops revenues
- Household income depends on access to land, labour, capital, and of-farm income (Chavas, et al., 1999)
- The integration with farming systems is important, namely to address synergy among the components (Pretty and Hine)
- Livestock interventions cover a wide range of activities
- The constraints presented are comparable with those identified by Pretty and Hine

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●			●

Soil and water management	Increased household access to food	Increased household income	Decreased distress sales of household assets	Decrease in seasonal migration
<p>Water Harvesting and Soil Rehabilitation in India and Africa: Potential and Practice (a synthesis of case studies prepared by Agarwal (2001) and Mascaretti (2001), in (Dixon, et al., 2001)</p>	<p>From 1977 and 1986, wheat and maize production increased. By the mid-1980s, Sukhomajri had turned from a food-importing village to a food-exporting village (Sarin 1996). Protection of the watershed has led to increased grass production: from 40 kg per hectare in 1976 to 3 tons per hectare in 1992.</p>	<p>Increased availability of fodder led to a transformation of livestock production systems. The number of goats went down while the number of buffaloes went up. This led to increased milk production (ibid). The village began to earn about Rs.350000 from sale of milk. Some Rs.100000 are earned collectively from sale of bhabhar (a highly fibrous grass commonly found in the region called bhabhar <i>Eulialopsis binata</i>) every year (ibid). The 400-hectare Sukhomajri forest today has over 300000 highly valuable khair (<i>Acacia catechu</i>) trees (Dhar, 1997). Each tree provides about 100 kg of wood which sells at about Rs.30 (US cents 70) per kg. Thus, each tree is worth Rs.3000 and the entire forest is worth Rs.90 crore (Rs.900 million or US\$21.08 million). If the forest is harvested on a sustainable basis - say, about 10000 trees a year with a girth of more than 60 cm - the forest will yield Rs. 3 crore (US\$0.7 million) annually (Mittal 1998).</p>		

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●		●	●	●		●

Diversification of small-scale producers into export horticulture (snow peas and broccoli)	Increased household access to food	Increased household income	Decreased distress sales of household assets	Decrease in seasonal migration
Private sector-led diversification among indigenous producers in Guatemala Gulliver (2001) in (Dixon, et al., 2001)		By 1996, it was estimated that 21,500 indigenous families were involved in direct production of these two crops, generating estimated gross farm incomes in the region of US\$30 millions. This equates to almost US\$1400 per family. On the basis of an estimated 516 person days of labour per hectare for snow peas, and 191 person days for broccoli, it can be calculated that this family income was achieved for an average of 0.5-0.6 person years of labour input per family, or an earning of approximately US\$2500/annum/person year employed		

“A further US\$28 million was calculated to accrue annually to the wholesaling, processing, packing and export sector within Guatemala, some of which would benefit rural inhabitants engaged in collection, packing and transport activities. In fact, a study undertaken in 1994 estimated an indirect labour multiplier of 0.26 in relation to non-traditional agricultural activities²⁶, suggesting that as many as 27,000 families may have derived employment from these activities, without counting those occupied in producing mini-vegetables, raspberries and other later crops. With a conservative family size estimate of six persons, these two non-traditional crops may have contributed to poverty alleviation for over 160,000 rural poor in Guatemala. Furthermore, these numbers do not take into account providers of goods and services in rural areas, who were able to establish business in response to rising rural demand. These certainly exist but no data on their numbers is available.”

NOTE: It remains to be seen whether this approach fits into the definition of sustainability that Pretty and Hine recommend, especially with regards to accounting for externalities and dependency on fluctuating markets.

Agricultural outcomes	Nutritional outcomes	Natural Capital	Physical Capital	Social Capital	Human Capital	Financial Capital
●	●	●				●

Diversification of local agriculture (Sorghum cultivars, soil erosion control, chem. fertilizer and insecticide)	Increased household access to food	Increased household income	Decreased distress sales of household assets	Decrease in seasonal migration
Modeling the impact of technological change on nutrition and marketing surplus (Ahmed et al., 2001) in (Dixon, et al., 2001)	<p>Data for 1st and 2nd. Season for Maize, beans, maize/maicillo, sorghum, sureño, catracho, (total area, rented area</p> <p>With the introduction of the new technology, the average daily intake of calories and protein increases to 2615 calories and 70 g of protein. Clearly, the introduction of these new technologies would help offset nutritional deficiencies even for the moderately risk averse farmer.</p>	<p>Decision variables: crop mix and technology for first and second stages (cropping seasons), land renting, borrowing, monthly labour hiring in and out, purchases and sales of consumption goods, and quantities of consumption goods, and inventories including cash.</p> <p>The sources of cash in the “expected direct utilization model” include: sales of grain and beans, off-farm work, borrowing and remittances from family members living off-farm.</p> <p>At higher levels of risk aversion, the household is a net seller of all crops. By increasing the profitability of sorghum relative to beans and maize (particularly at low levels of risk aversion), the farmer is able to produce substantial amounts of sorghum at the expense of his output of beans and maize. Hence, he becomes a new buyer of both. However, he is able to market substantially more sorghum. Due to risk aversion, the farmer diversifies across crops in order to ensure a more diverse consumption bundle on average. In this case, although less is marketed in comparison to the risk neutral farmer, some of each crop is sold, even with traditional technology. When new technology is introduced, the farmer substitutes the increase in beans and sorghum surpluses for a decreased surplus of maize.</p> <p>Higher income, generated from adoption of new technology, allows for increased access to a larger and more varied diet as well as improved nutrition.</p>		

This is one of the few articles linking agricultural technology with nutritional outcomes, yet the emphasis of the model centers on the production variables with only basic attention to nutritional indicators. Not all the technology input fit with the criteria proposed by Pretty and Hine for sustainability.

Annex 4: Introduction of the Sustainable Livelihoods Approach at FAO

Livelihood Support Programme

“IMPROVING SUPPORT FOR ENHANCING LIVELIHOODS OF THE RURAL POOR”

GCP/INT/803/UK

Launch Workshop

24 January, 10:00 – 12:30

Iran Room

FAO and other agencies have been exploring Sustainable Livelihoods (SL) approaches as a means of enhancing the quality and impact of their programmes on the reduction of poverty and food insecurity. In this context, the promotion of sustainable livelihoods is a key strategy for FAO in its Strategic Framework for 2000-2015. With support from the UK Department for International Development (DFID), which will provide \$7 million over 5 years, the Livelihood Support Programme (LSP) seeks to improve the impact of FAO interventions at country level through the effective application of Sustainable Livelihood approaches. The SL methods and lessons arising through the LSP are aimed at helping FAO to deliver field programmes, policies, and institutions that better support the livelihoods of the rural poor.

The overall LSP programme is composed of nine complementary Sub-Programmes (SP), each with its own theme, inter-departmental team, budget, and an evolving workplan developed in collaboration with the other Sub-Programmes. The overall LSP management team includes representatives from each of the Sub-Programmes.

The LSP has programmed **three major outputs**:

1) *Institutional learning processes developed and operational. (SP 1.1)*

2) *FAO staff know how to apply Sustainable Livelihoods principles and methods.*

SP 2.1 Capacity building in SL approaches and their field applications

SP 2.2 Cultural and linguistic transposition of basic SL concepts and tools; and

SP 2.3 Appraisal by stakeholders of SL approaches and methods.

3) *SL approaches and methods enhanced and incorporated into cross-sectoral field activities.*

SP 3.1 Building stakeholder capacity to improve access of the poor to natural assets;

SP 3.2 Participatory policy reform in support of sustainable livelihoods for the rural poor;

SP 3.3 Livelihoods diversification and enterprise development;

SP 3.4 Natural resource conflict management for improving livelihoods; and

SP 3.5 The mainstreaming of SL approaches into agricultural and natural resource investment and technical assistance projects.