1 – Methodology and approach

1.1 – Context

At the dawn of the twenty-first century two competing agricultural models are positioning themselves in an attempt to win loyalty, support and commitment from farmers, policy makers and consumers (Marsden, 2001). One, a biotechnology-led extension of the Green Revolution, holds the promise of feeding the world through improved yields, greater resistance to diseases and greater efficiency through the manipulation of the genetic structure of plants (Pretty, 1998). Critics argue that the risks involved in releasing GMOs into the environment are unknown and unpredictable (ESRC Global Environmental Change Programme, 1999). Moreover, particularly in the South, the adaptation of GMO technology implies a huge and unacceptable transfer of intellectual property rights (and thus power) from farmers to seed companies and laboratories (Shiva, 2001).

The other model, which we explore here, of organic and agroecological farming is based upon developing and maximising the use of locally available natural resources to maintain and build soil fertility and to deter pests and diseases. It is a decentralised, bottom-up approach to improving agricultural capacity that relies upon, promotes and celebrates diversity. Critics of this approach claim that reliance on natural and often traditional, production systems will prove inadequate in the task of feeding the world either now or in fifty years time – when world population levels are predicted to have doubled (Pinstrup-Andersen, 2000).

The ghost of Malthus appears to still haunt debates about food security, despite widespread recognition that it is not food production per se which determines whether the world is fed or not (Grolink, 2000), but the political and economic structures which provide, or deny, access to 'food entitlements' (Sen, 1986). In this sense arguments as to whether different forms of agriculture, such as GM, intensive or organic systems can 'feed the world' are somewhat simplistic (Geier, 1998). Other significant intermediary factors influence access to, and distribution of, food on the global and regional scales, and within individual communities (Woodward, 1998). This said, different models of food production do play a role in shaping these entitlements: through making use of different mixes of labour and capital (and increasingly nowadays, intellectual property); of locally produced and imported inputs and; different market orientations.

Such differences are also reflected in the research structures that help inform and develop these different models. Conventional agricultural research tends to be laboratory/experimental farm based, often aiming at producing universally applicable, context-breaking solutions (e.g. hybrid seeds). Organic research, by contrast, tends to be more diffuse, 'farm based', participatory and draws upon local knowledge and tradition. Significantly, it is also focused upon 'public goods', resources and techniques that are not readily patentable but which are, generally, freely available. This may significantly contribute to explaining why organic research attracts only a fraction of investment from private sources compared to conventional and biotechnological approaches.

1.2 – Aims and objectives

This report was commissioned to provide an overview of the 'state of the art' of organic and agroecological farming systems in the 'South' (see below for an explanation of this terminology). The primary focus of the report is on identifying systems, technologies and methods which are proving effective in increasing yields, eliminating (or significantly reducing) the need for chemical inputs and (as a 'second tier' objective), in increasing farmer incomes.

The aims of the report are:

- to identify specific (and recently developed) projects/systems and, through this, identify possibilities for developing and supporting initiatives that have hitherto been neglected or underdeveloped at both research and project level;

- (in line with the above) to seek to identify gaps in current knowledge and support;

- to provide indicators of likely future developments (both in research agendas and project development).

In meeting the first aim we provide a broad overview of the state of development of Organic and Agroecological approaches (OAA) across the South, focusing on countries where a critical mass has begun to develop and where innovative new approaches are being put in place. We identify a number of case studies where OAA is presently proving successful in meeting a range of diverse objectives: improving yields, food security, farmers' incomes and health status, and reversing established patterns of land degradation. We identify in our recommendations potential avenues for assisting with the development of OAA: building links with existing research and extension networks, engaging with established grassroots NGOs, and strengthening effective advocacy of the need for, and benefits of, OAA amongst policy makers, farmers and consumers.

Identifying gaps in knowledge has proven a more challenging task. The nature of OAA, rooted in specific ecological, agronomic and cultural contexts, militates against identifying single key research issues that can provide universal solutions. For this reason we have not singled out specific research issues relating to say, soil fertility or pest management. Our overriding impression from the literature reviews and responses to our survey is that the main priorities of those engaged with OAA are twofold: those of disseminating existing knowledge through training, participatory research and experimentation, and differentiating OAA produce through effective yet economic certification processes.

Recent years have witnessed a surge of interest in and rapid development of OAA in many parts of the South. The convergence of several sets of interests (commercial, developmental, and environmental) around the OAA agenda is in itself encouraging. After years of being marginalised OAA is becoming increasingly accepted by the 'mainstream'. The most significant manifestation of this is the recognition by the UN Food and Agriculture Organisation (FAO) of the role that OAA can play in promoting 'sustainable agriculture'. Given this growth of interest we anticipate a significant expansion in both levels of production and the 'knowledge base' surrounding OAA in the very near future. This notwithstanding, there remain significant practical and attitudinal barriers to its further expansion.

1.3 – Scope and definitions

For the purpose of this study we have stepped aside from debates over what constitutes a 'developing' or 'Third World' country and opted for a broad geographical definition of the 'South': one which covers all of Africa, Asia (with the exception of Japan), Latin America and the Caribbean. This approach gives us the scope to examine a wide range of organic and agroecological practices existing in different climatic, topographic and socio-economic situations. The systems and methods that we have examined vary significantly from, at one extreme, those that primarily meet household food requirements where surpluses are bartered or sold, to market (often export) focused production systems. These different orientations imply quite different rationales amongst producers and lead us into a

discussion of the similarities and differences between organic farming and agroecology.

Legal definitions of organic produce are codified in a number of formal standards that define the regimes that producers (or processors) need to work within in order to claim organic status. Globally there are more than 100 different organic certification systems in place (Van Elzakker, cited in Scialabba and Aubert, 1998). Of greatest importance are the international standards: the EU Organic Directive Regulation (CEC, 1991), the IFOAM (International Federation of Organic Agricultural Movements) Basic Standards (IFOAM, 1999) and the guidelines produced by the FAO/WHO Codex Alimentarius Commission (1999).[1] By nature these are prescriptive, defining the applications (e.g. pesticides and fertilisers) and processes (e.g. irradiation and genetic modification) which are and are not permitted in food described as 'organic'. These standards are concerned primarily with consumer protection and intended to provide unambiguous guarantees to consumers who are in general prepared to pay premium prices for organic produce. Detailed analysis of these standards, and of the differences between them, serves little purpose here. Of more interest are the characteristics, principles and working practices involved in organic production,[2] which we explore below.

One widely used definition of organic production is that provided by the United States Department of Agriculture (USDA):

'A production system which avoids or largely excludes the use of synthetic compounded fertilisers, pesticides, growth regulators and livestock feed additives. To the maximum extent feasible, organic farming systems rely upon crop rotations, animal manures, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests.'
(USDA, 1980 cited in Scialabba and Aubert1998)

Table 1 (below) expands on this definition by exploring some of the key aims, principles and management strategies employed in organic agriculture.

Table 1: Key aims, principles and management practices of organic farming

Aims and principles

To develop, as far as possible, closed flows of nutrients and organic matter within the farm and therefore promote the ecological resilience of the farm unit.

Maintenance and improvement of soil fertility

- Mixed livestock and arable farming
- Use of farm compost, mulches and green manure
- Recycling and composting of vegetative matter (including 'off-farm' materials)
- Use of crop rotation, fallows and strip cropping
- Use of nitrogen-fixing plants
- Mixed cropping to maintain soil cover and maximise nutrient availability
- Use of deep-rooting plants to recycle nutrients
- Agroforestry
- Use of contour bunds, terracing and other mechanical methods to prevent soil loss

Pest and disease control

- Crop rotations and intercropping (both of different species and geni)
- Companion planting
- Use of resistant varieties
- Use of alleopathic / antagonistic plants
- Use of physical barriers (e.g. tree breaks or insect traps)
- Use of natural pesticides
- Use of biological controls, such as predators
- Control of carriers
- Hand picking

Adopted from Harris et al.., (1998) and Scialabba, (1999)

Notably both the definition and the key aims, principles and management practices provided above make no reference to social justice or economic viability, both of which are key features in determining the acceptability of OAA to consumers and producers alike. The importance of these issues is addressed later in the paper – for the moment we (like the authors above) confine ourselves to discussing the agronomic aspects of OAA.

The characteristics and management principles discussed above are not solely restricted to organic farming. 'Conventional' farmers may well employ some of these techniques. For example, livestock and/or green manures are used in many 'conventional' farming systems as a means of building or maintaining soil fertility. However, they are increasingly being replaced by artificial inputs, as the logic of specialisation in a globalised market place favours the development of monocultural farming systems at the expense of mixed ones.

Innovations in organic farming methods (often driven by the need to meet standards) have a relevance that potentially extends beyond the organic sector (FAO, 1998 p.9). In Israel, for example, greenhouse management techniques pioneered by organic farmers have now become widely adopted by conventional farmers (Raviv, 2000).[3] Similarly, principles of community ecology developed to control pests in European orchards have also benefited 'conventional' growers (Brown 1999a and b). While conventional producers may adopt some organic techniques, organic farming remains differentiated from conventional approaches by virtue of its exclusive reliance on natural methods of building soil fertility and combating pest and diseases.

Agricultural systems that rely exclusively on natural methods of building soil fertility and combating pests and diseases fall into two categories: certified organic production, which has been inspected and is verified as 'organically produced', and *de facto* organic production. Certified organic production forms the basis of what is now a phenomenally rapidly growing market. This may however represent just the tip of the iceberg in terms of land that is managed according to organic precepts but is not certified as such. Such *de facto* organic farming appears to be particularly prevalent in resource-poor and/or agriculturally marginal regions where local populations have a limited engagement with the cash economy. In such situations, farmers have little alternative but to rely upon locally available natural resources to maintain soil fertility and to combat pests and diseases. In some instances sophisticated systems of crop rotation, soil management and pest and disease control have evolved solely on the basis of traditional knowledge. The first case study in this report, of the Chagga Home Gardens in Tanzania (see over) provides an example of an intensive, sustainable, multi-functional organic system. Such systems are associated with remote areas, often involving culturally homogenous populations. Although primarily subsistence-oriented, these systems often also produce a range of cash crops.

As in many instances there is no official recognition of the organic status of this land, there are very few reliable estimates of the extent to which *de facto* organic farming is practised in the South. Estimates of the extent of *de facto* organic farming vary widely. Our impression is that the amount of land in the *South* farmed on this basis exceeds, probably by a significant factor, land that is formally certified as being organic.[4] Kotschi (2000), claims that '*80% of registered organic land in the Third World has not undergone any change in management practice*', suggesting that there is a large pool of organically managed land which is not recognised as such, that could readily be certified if market conditions permitted.

De facto organic farming is an approach that is embraced and celebrated by agroecology. This approach shares much common ground with the 'standards-driven' organic model. Both promote a 'closed system' approach, use multiple and diverse cropping and rely on biological sources for building soil fertility and controlling pests and diseases. Agroecology, however, is more specifically rooted in the experience of the *South* (particularly Latin America), and places greater emphasis in *'acknowledging the socio-cultural and ecological co-evolution and inseparability of social and natural systems'* (Norgard, 1987). Thus, agroecology contains a more explicit social component than the organic approach, whose focus is more upon verifiable technical standards. Further, agroecological research is more strongly orientated towards the social sciences, embodying a 'human ecology' approach (Glaeser, 1995). Agroecological research is more culturally specific and more explicitly adopts a 'farmer first' philosophy. Agroecological systems do not however provide internationally recognised standards and therefore do not provide the same opportunities for attracting market premia as certified organic systems. While some tension exists between the 'standards driven' approach of organic production, and the more culturally relativist approach of agroecology, practitioners and advocates of the two approaches share a broadly common philosophy and agenda, and in many instances work closely together.

Case study 1: the Chagga Home Gardens (Mt. Kilimanjaro, Tanzania).

The Chagga Home Gardens provide an excellent model of integrated and sustainable land management systems that use a minimum of external inputs. The Chagga people farm the southern and eastern slopes of Kilimanjaro (900-1900m above sea level). Most also have lowland plots on the drier plains, within 20km of their home gardens. These are mostly used for staples (e.g. millet, beans and sorghum) and fodder. It is their home gardens that are of primary interest as they embody many key elements of organic and agroecological management strategy. The features of the Chagga Home Gardens include:

- Capture of snowmelt water for irrigation through an elaborate system of channelling
- A diversity of cropping for cash and consumption purposes, including bananas (15 varieties), coffee, yams, beans, medicinal plants, bees and livestock (see below)
- Maintaining cattle, pigs and poultry that provide both protein and manure. (Mammals are stall-fed with fodder from the trees and grasses from the plain and the manure recycled, providing an ongoing source of fertility)
- A design to maximise diversity – elaborate patterns of vertical zoning exist – providing niches within the gardens for different species and a range of sunny / cooler conditions
- The use of a wide range of woody species (Fernandes identifies and lists the functions of thirty nine), many of which are multifunctional, providing fruit, fodder, fuel and medicines as well as nutrients and crop protection
- Cropping patterns designed to maximise continuity of yield
- Bees, used to provide honey and for pollination.

The area is one of the most densely populated in rural Africa with about 500 people per square kilometre. Average plot sizes are small, just over 1 hectare, and support households with, on average, 9

family members. The system has been maintained in a stable form for more than 100 years. Although individual crops may sometimes fail, multiple failures are unknown. Growing a range of cash crops (bananas, coffee and, in extremis, timber) also provides some protection against market price fluctuations. While there are some concerns that the system is approaching its productivity limits within the present management regime, strategies for further enhancing management techniques may yet be developed. Some believe that the principles of this management system could be successfully transferred to similar upland areas in other parts of Africa: particularly Rwanda, Ethiopia and Kenya, although local cultural and ecological differences would need to be taken into account.

(Sources: Fernandes (undated), Harrison (1987), Küchli (1996))

A third approach, incorporating elements of both the organic and agroecological models, is that of 'sustainable agriculture'. This has been a focus of activity and research within the 'development' field for at least a decade. It is focused around three core principles: those of *'ecological soundness, social responsibility and economical viability'* (Thrupp, 1996). Many projects and programmes under the rubric of sustainable agriculture explicitly aim to eliminate or reduce the use of artificial inputs, use local resources to build soil fertility and increase diversity within farming systems (for examples of such projects see Thrupp 1996; Whiteside 1998; Pretty and Hine 2000b). However, both the organic and agroecological movements experience some unease about the looseness of definitions embraced by sustainable agriculture. As with many other applications of the term 'sustainability', tensions can often arise over operational definitions of 'ecological soundness', 'social responsibility' and economic viability (Butler-Flora 1998). Rosset and Altieri (1997, p.283) argue that sustainable agriculture is an extremely weak form of agroecology, which *'fails to address either the rapid degradation of the natural resource base, or resolve the debt trap and profit squeeze in which many farmers find themselves trapped'*.

Sustainable agriculture may be likened to a broad church, which attracts a diverse congregation with a range of different 'core beliefs'. They include those whose primary concerns are with ecology and 'farmer first' approaches, but also *'high –tech advocates who propagate a second green revolution with gene technology and a new generation of agrochemicals'* (Kotschi, 2000 p.653). The attempt to include all these interests under a single defining banner leads to sustainable agriculture *'lacking a clear profile' (ibid.)* and lacking clear indicators or definitions of how it differs from 'unsustainable agriculture'.

These disagreements aside, organic, agroecological and sustainable approaches to agriculture share common methodological and theoretical ground in their use of participative approaches to agricultural (and rural) research and development. This participative approach to research and development has, in the last two decades, grown into a significant discipline in its own right, generating a substantial body of literature. (For examples of work in this area see: Haverkort *et al.*. 1991; Alders *et al.*. 1993, Conway 1985; van Veldehuizen, 1997; Gündel 1998; Pretty *et al..*, 1999 and Bainbridge *et al.*. 2000). With a focus on the importance of traditional knowledge and on innovation, experimentation and diffusion of agricultural techniques, this body of literature contains much of relevance to understanding how OAA can be better promoted, and we draw upon it where it specifically relates to organic / agroecological systems.

In this report we focus both on 'whole farm' systems, and on individual techniques. Whilst

the first group represents exclusively organic or agroecological approaches, the latter group may form component parts of organic, agroecological or sustainable farming systems, be transferable across all three agricultural approaches and, in many cases, also be applicable to conventional and more intensive systems.

1.4 – Research methods

The information presented in this report has been generated by a desk-based literature review, supplemented by a semi-structured survey of organic organisations, NGOs and academics and a selected number of face-to-face and telephone interviews. Details are provided below of the work undertaken in each of these three areas.

Literature reviews

The literature relating to organic and agroecological farming is spread across a number of sources. At the outset three core sources of literature were identified: the organic movement's own publications (particularly those from IFOAM), those of development and environment agencies, and broader academic literature. In addition a number of electronic information resources were visited, including remote access catalogues, the Web of Science and the Index of Theses.[5] Keyword searches were undertaken on 'organic farming' and 'agroecology'. Between them these sources provided threads into a varied and eclectic range of fields of literature.

The role and potential of OAA in the South is attracting interest from a range of disciplinary backgrounds including: agricultural, plant and soil science, rural and third world development, rural sociology, geography and marketing. Moreover, the literature is spread across a range of types of sources: academic journals, trade publications, conference proceedings and agency reports. As the study progressed we became increasingly aware of the importance of 'grey literature' in providing current and informed commentary on developments in the field. Many key texts were only identified as a result of the survey that we conducted. Many were e-mailed to us as 'works in progress' or internal reports prepared as funding bids or project evaluations and not originally intended for publication. We acknowledge the invaluable contribution of the many individuals and agencies who took the trouble to assist our project in this way. Thus, in drawing together this literature review we have tapped into, and sought to synthesise, a highly fragmented but rapidly growing knowledge base.

Survey

In addition to the literature search a survey was undertaken of organic organisations, development and environmental agencies with an involvement in OAA, and informed academics. The initial sample frame for the survey was compiled from the IFOAM membership directory (IFOAM, 2000), from which we selected all IFOAM members in the South, together with those in the industrialised world claiming to have active involvement in the South. Relevant development and environmental organisations and academics with a known interest in the field were identified and added to the list. Requests for information were also sent out on the networks of the International Sociological Association RC40 group and the food network of the International Human Development Project. Throughout the project, a 'snowball' effect was generated as feedback from these initial contacts continued to generate further suggestions of individuals and organisations to contact and which continued to elicit responses throughout, and beyond, the contracted period of research.

Given the time constraints of this project, and the broad range of interests of the organisations and individuals whom we wished to contact, the survey itself was

carried out on an informal, semi-structured basis. In preference to a questionnaire format, which may well have limited the types and range of responses elicited, a letter was written (and translated into French, Spanish and Portuguese) outlining the project and requesting details of projects, good practice, policy and research issues. More than 400 copies were sent out throughout December 2000 and January 2001 (the vast majority by email) and more than 150 responses received by the end of February.

Interviews and visits
In addition to the literature review and survey, a limited number of visits were made to institutions identified as having specialist knowledge or expertise relevant to this study. These are listed below. In most cases these visits had the dual purpose of using library resources and meeting with informed individuals working at those institutes – in all cases these interviews were of an informal nature.

- The Welsh Organics Centre, Aberystwyth (Nic Lampkin, Suzanne Padel, Peter Midmore and Anke Zimpel)
- Voluntary Services Overseas, London
- International Institute for Environment and Development (Camilla Toulmin, Judy Longbottom and Nichole Kenton)
- The Gaia Foundation, London (Liz Hoskins and Sue Edwards, Institute for Sustainable Development, Tigray)
- International Human Development Centre, Amsterdam
- University of Cordoba (Prof. Eduardo Guzman)
- The Soil Association, Bristol (Rob Hardy)

In addition to these, a visit was made to Biofach (the World Organic Trade Fair) held at Nürnberg, Germany in February 2001. This proved particularly fruitful, enabling contact to be made with many producers from the South and with representatives from several leading international organic organisations.[6] These meetings and conversations significantly helped shape the final structure and emphasis of the report.