The Real Green Revolution

Organic and agroecological farming in the South

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Foreword

Food security for all the world's people

Dr Doug Parr, Greenpeace Chief Scientist

The crisis in Argentina in late 2001 illustrated again a frustrating and unjust reality: there is no direct relationship between the amount of food a country produces and the number of hungry people who live there. In 2001, Argentina harvested enough wheat to meet the needs of both China and India. Yet Argentina's people were hungry. Argentina's status as the world's second largest producer of GM crops – largely for export – could do nothing to solve its very real hunger problems at home. For fifty years conventional agriculture has been getting less and less sustainable. Chemical pesticides, fertilizers and hybrid seeds have destroyed wildlife and crop diversity, poisoned people and ruined the soil. Now that the organic movement is taking off in the industrialised world, governments, international agencies and global agribusiness corporations must stop promoting this destructive system in the South. Instead, there must be coherent and long-term support – in practice as well as in principle – to enable the nascent ecological farming movement in poorer countries to continue to grow into the future.

The world is on the brink of a second 'Green Revolution', which – unlike the first – has the potential to truly live up to its name. This is not a revolution in biotechnology; still less has it anything to do with genetic engineering. Instead, it is a global move towards ecological agriculture, which promises to both feed a growing world population and to do so sustainably – without compromising the needs of future generations to feed themselves.

Working in tandem with nature and encouraging biodiversity and local self-reliance, this new trend towards organic and agroecological farming is vibrant through Africa, Latin America and Asia. Although still largely overlooked by policy-makers, this movement presents a hopeful alternative to a world that would be dominated by corporate agrochemical giants and monocultural agriculture. And, as this report shows, organic farming is not simply a passing fad for consumers in the rich world. Put into practice in the South, it can increase food security, reduce poverty and protect environmental resources for the future – unlike its conventional alternative.

Organic increasing

This report identifies some of the positive trends currently emerging, for example:

- Latest estimates of land managed according to ecological principles vary from 15.8 to 30 million hectares (equivalent to about 3% of agricultural land in the South).
  This figure would almost certainly be much higher if de facto organic agriculture practiced by traditional subsistence farmers were to be included.

- Two thirds of new members of the International Federation of Organic Agricultural Movements (IFOAM) come from the South.

- International agencies – principally the UN's Food and Agriculture Organisation (FAO) and the Centre for Trade and Development (UNCTAD) – have woken up to the potential of organic farming in raising farmers' incomes, creating jobs and enhancing food security.

- Cuba has been moving towards a nationwide organic system, and 65% of its rice and nearly 50% of fresh vegetables are now produced organically. Argentina now has the largest area of land under organic cultivation of any country in the world after Australia.

Greater diversity

Maintaining agricultural biodiversity is vital to ensuring the long-term food security of all the world's people. This report also shows that agroecological farms exhibit a much greater array of biodiversity than conventional chemical-dependent farms, with more trees, a wider diversity of crops and many different natural predators which control pests and help prevent disease. In many parts of the South, the diversity of crop species on organic and agroecological holdings typically numbers in the hundreds, in stark contrast to the monoculture encouraged by conventional systems. For example:

- Indigenous farmers in Peru cultivate more than three thousand different types of potato.
- More than five thousand varieties of sweet potato are cultivated in Papua New Guinea.
- In West Java, researchers have identified more than 230 species of plant within a dual cropping system, which includes 'agroforestry' home gardens and outfields. In Mexico, the Huastec Indians manage a number of plots in which up to 300 species are cultivated. Areas around the house may contain between 80-125 useful species, many with medicinal properties.

This diversity is maintained through traditional seed-swap networks, which are now being extended and encouraged by the organic and agroecological movement. Whilst global industrial agriculture has led to a situation where the world's population gets 90% of its food calories from a mere 15 species of crops, organic and agroecological farmers are providing a vital service in maintaining genetic diversity for the future – a service increasingly threatened by genetically-modified pollution and corporate biopiracy. The maintenance of a wide range of crops provides food security throughout the year, an overwhelmingly important consideration for peasant farmers, who are intuitively aware of the dangers of monocropping.

Working with ecology

This report shows how organic and agroecological approaches to agriculture are helping to conserve and improve farmers' most precious resource – the topsoil. In contrast to the problems of hardening, nutrient loss and erosion experienced by conventional farmers, organic managers across the South are using trees, shrubs and leguminous plants to stabilise and feed the soil, dung and compost to provide nutrients, and terracing or check dams to prevent erosion and conserve groundwater. There is no 'one-size-fits-all' strategy, and the best approach varies with local expertise and ecological conditions.

Increasing yields

The widespread assumption that converting to organic means a decline in yields has been proven to be false, a conclusion supported by overwhelming evidence contained in this report. Case studies from many different countries – involving radically different practices, local conditions and crops – show dramatic increases in yields as well as benefits to soil quality, a reduction in pests and diseases and a general improvement in taste and nutritional content of agricultural produce. For example:

- In Brazil the use of green manures and cover crops has increased yields of maize by between 20% and 250%.
- In Tigray, Ethiopia, yields of crops from composted plots were between three and five times higher than those treated only with chemicals.
- Yield increases of 175% have been reported from farms in Nepal adopting agroecological management practices.
- In Peru the restoration of traditional Incan

terracing has led to increases in the order of 150% for a range of upland crops.

The importance is not just that yields are increased – important as that undoubtedly is – but that the increases are much more under the control of the farmers and communities that produce them, in contrast to a high input agricultural model where the benefits go to the equipment and chemical manufacturers and seed merchants.

Economic drivers

Across the South, engagement with the lucrative and rapidly growing organic foods market in the industrialised world is still the main driving force behind the development of the certified organic sector. Organic certification can generate big premia for primary producers, especially from export markets. Although some governments are now recognising the export potential of organic produce, its development so far has been driven almost exclusively by the NGO sector – often despite official hostility.

Remaining challenges

This report goes on to show that some key challenges remain, however. These include the following issues:

- Hostility from conventionally minded Southern governments and established corporate and bureaucratic interests are still holding back the potential of organic and agroecological agriculture.

- Many Southern-based NGOs promoting organic and agroecological approaches face crippling funding shortages, and are prevented from continuing their work often for want of very small amounts of money in comparison to that spent in the promotion of conventional agriculture.

- Mechanisms for transferring indigenous knowledge from one locale to another need further development and resourcing.

- The overwhelming majority of Southern organic produce is still sold as unprocessed primary commodities, leaving poorer farmers still exposed to the vagaries of world markets, and meaning that the benefits of processing and value-adding remain in the North.

- Much Southern-based organic production is for export to the industrialised world, raising the issues of 'food miles' and how best to protect local food security and self-reliance. However, local and national organic markets are developing in many poorer countries, notably Brazil, Egypt and Argentina.

- Expertise in certification is still overwhelmingly concentrated in the industrialised world, and achieving certification is a major barrier to many farmers in poor countries who lack literacy and other skills and facilities necessary.

What is needed

This report makes some clear and practical recommendations for how organic and agroecological agriculture should be supported and promoted. Some of these are highlighted below.

- Governments in the South should rethink the promotion of artificial pesticides and fertilisers on poorer farmers through extension workers, subsidies and media campaigns, and at the very least remove some of the barriers to NGO activity that currently hinder the growth of the organics sector. At best, Southern governments should begin to re-orient their priorities – educational, institutional and legal – towards promoting ecological and sustainable agriculture.

- Where *de facto* organic farming is practised, it is vital to help farmers develop self-confidence in their traditional knowledge so that they do not immediately switch to chemicals once they can afford them, as a

result of having been told for years that industrial farming is 'more modern'.

- Security of land tenure is essential for farmers to have sufficient incentive to develop long-term organic management strategies, and in areas where inequality of ownership is especially pronounced land reform will be necessary for ecological farming to become widespread.

- Much greater support must be devoted to those grassroots NGOs and projects that are the driving force behind the development of organic agriculture in the South. This requires a further mobilisation within Northern-based agencies to develop their own projects and work with Southern-based partners, and – crucially – greater financial support from the relevant funding bodies.

- Various successful projects are beginning to transfer the economic benefits of food processing to organic farmers in the South. These include the making of fruit into conserves in the Andes to the extraction of sunflower oil from hand-powered mills in Kenya. More resources and investment in these frequently low-tech solutions could have significant paybacks for ecological farmers across the Third World.

- Better links need to be fostered between different disciplines and approaches within the 'alternative' agricultural movement – bringing together (for example) foresters, researchers, livestock producers and horticulturalists in regional, national and international networks.

- The development of certification capacity in the South – by governments working in tandem with established NGOs – needs to be boosted to prevent the need for costly external inspections.

- Joined-up thinking between the organic and fair trade movements could be crucial in how the movement develops over the coming years, and developing synergies between social and environmental objectives.

- In addition, an agreement within the organic movement itself is needed on the inclusion of wider social and environmental criteria such as 'food miles' and workers' rights.

Looking to the future

The dominant international worldview amongst policy-makers and opinion-formers still holds that food security for a growing world population can only be achieved by promoting ever more intensive chemical-dependent agriculture. The evidence from this report is that this viewpoint is dangerously flawed. Firstly, the relationship between food security and food production is complex – famines occur because people lack the money to buy food, not solely because their own crops have failed. Secondly, chemical-dependent agriculture is fundamentally unsustainable. It exchanges long-term ecological health (involving issues like biodiversity and topsoil quality) for short-term productivity gains, and new developments in the genetic manipulation of plants and animals are set to worsen this disastrous trajectory. Thirdly, food security is endangered by encouragement for farmers to opt for high yielding mono-crops requiring substantial inputs. If the crops fail farmers are in danger of losing their land to cover bad debts – further contributing to rural-urban drift in the South.

Ultimately, we believe the key aim at a practical level must be to knit together the different aspects and drivers of the organic and agroecological approach into a coherent international movement which is capable of providing an alternative to the conventional system. As ecological agriculture becomes more successful economically, and an increasing number of farmers throughout the South decide – independently or with assistance from NGOs – to jump off the chemicals treadmill, the chances of this real Green Revolution succeeding become greater every day.

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The authors welcome feedback and comments on this report which can be addressed to parrottn@cardiff.ac.uk

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.

2. The world grows organic

2.1 – Estimating the extent of global organic production

Only in recent years has published data regarding the extent of organic agriculture in the South become available. The International Trade Centre (ITC) recently published a directory on products and market development in the organic sector (1999) with the aim of fostering trade opportunities, especially for developing countries. This provides a country-by-country analysis of organic production and demand, together with details of available produce and the principal trading and development organisations. It also provides some details (though sketchy in places), about the profiles of 'non-certified' activity.

More recently the German organic organisation, Stiftung Ökologie & Landbau (SÖL) published a statistical digest of global organic production (Willer and Yussefi, 2000, 2001). These figures provide the basis for a more comparative analysis of the extent of organic production in different parts of the world (see tables 2.1. and 2.2, below for summaries). A further useful data source is the annual IFOAM members Directory (IFOAM, 2000), which lists members by country, thereby permitting proxy estimates of activity rates.[7]

The FAO has also prepared a number of studies of organic systems on a global scale (FAO, 1998, 1999, 2000a; Scialabba 1999, 2000; Scialabba and Aubert, 1998).[8] They have recently commissioned a number of specialist reports and are in the process of constructing a database of organic literature (FAO, 2001). Thus the literature providing global perspectives on OAA, while not extensive, is rapidly growing and is likely to be more substantial in forthcoming years.

The SÖL reports (Willer and Yussefi, 2000 & 2001) provide valuable early estimates of the extent of organic production on a global basis. Drawing upon the ITC report (1999) and other data sources, they identify around 15.8 million hectares of land around the world that are managed organically. Argentina is clearly the largest certified organic producer in the South with 3 million ha. (1.77% of its total agricultural land) under organic production. This accounts for almost 19 % of total global organically managed land. Other Latin American countries account for around 1.3% of the global total of organically managed land. Africa and Asia account for only fractions of a percent (0.14% and 0.33% respectively) (Willer and Yussefi, 2001, p.28).[9]

Whilst these figures provide a useful overview, there are evident omissions in the data. For example, there is no data for many countries known to be exporting organic produce to the industrialised world. Walaga (2000) identifies a number of African countries which are known to be exporting organic produce but which do not appear in these tables. These countries include: Algeria, Benin, Burkina Faso, Comoro Islands, Ivory Coast, Madagascar, Morocco, Mozambique, Senegal and South Africa (see table 3.2). Such discrepancies occur due to a number of factors. In part there is the problem of a time lag in data collection. Even in the EU, which has a strong data gathering capacity, it is difficult to collate information that is less than two years out of date (Foster, pers. comm.). The rapid expansion of certified organic production in the South and the more limited capacity for data collection mean that the figures provided in Tables 2.1 and 2.2 are almost certainly underestimates. Other factors may play a key role: the cost and other constraining factors of certification (discussed in section 4. 6), means that such data is only likely to be collected for land where much, or all, of the crop is destined for export markets. The only likely exceptions to this are those few countries that have established their own (IFOAM accredited)

Table 2.1 – Certified organic land by country (hectares)

	Latin America	Africa	Asia
>1 Million ha.	Argentina (3M)		
100,000 – 1 M ha.	Brazil		
25-100,000 ha.	Mexico		
5-25,000 ha.	Paraguay, Peru, Costa Rica, Bolivia, Guatemala	Tunisia, Uganda	Turkey, China, Japan
1-5,000 ha.	El Salvador, Chile, Nicaragua, Uruguay	Tanzania, Egypt, Zimbabwe	Papua New Guinea[10], Israel, India, Taiwan
<1,000 ha.	Suriname, Colombia Malawi	Cameroon, Mauritius,	Republic of Korea, Sri Lanka, Honk Kong, Lebanon, Philippines
Known existence of organic production but figures not available	Ecuador, Honduras	Burkina Faso, Ghana, Zambia	Pakistan

Adapted from Willer and Yussefi, (2000 & 2001)

Table 2.2 – Certified organic land by country (% of agricultural land)

Organic land as % of domestic agricultural total	Latin America	Africa	Asia
> 1%	Argentina (1.77%)		
0.5 – 0.99%			Papua New Guinea
0.15-0.5%	Costa Rica, El Salvador, Surinam, Guatemala	Mauritius	Japan
0.025-0.14%	Paraguay, Mexico, Brazil, Peru	Tunisia, Egypt, Uganda	Turkey, Republic of Korea, Lebanon
<0.025%	Bolivia, Nicaragua, Chile, Uruguay, Colombia	Tanzania, Cameroon, Zimbabwe, Malawi	Sri Lanka, China, India

Adapted from Willer and Yussefi, (2000 & 2001)

certifying bodies, where certification costs are likely to be more in line with the premia that producers can expect to obtain on local markets.[11] Organic production systems which work on a 'trust' basis, agroecological and traditional *'de facto'* organic systems will not be included in these figures. Between them these are likely to significantly outweigh formally certified holdings.[12]

An alternative approach to gauging levels of OAA is through analysis of IFOAM (International Federation of Organic Agricultural Movements) membership figures (see Table 2.3, over). These provide a useful proxy method for estimating levels of OAA, which cover both certified and informal, 'de facto' approaches. Although in some cases IFOAM membership figures for individual countries correspond with the amount of certified organic land, there are many instances where they do not. For example, IFOAM has members in many countries that are not identified as having any certified organically managed land. Some of these countries (notably Kenya, Senegal, Venezuela, the Philippines and South Africa) have a relatively high number of

Table 2.3 – IFOAM Members by Country

No. of IFOAM members	**Latin America**	**Africa**	**Asia**
39			India
18	Argentina		
16		Kenya	China
10		Senegal	
9	Venezuela		Philippines
8	Chile, Mexico		
7	Brazil	Burkina Faso, Egypt	Turkey
5	Bolivia	South Africa	Sri Lanka
4	Ecuador, Peru		Malaysia, Pakistan
3	Costa Rica, Guatemala, Nicaragua, Paraguay	Benin, Cameroon, Congo, Ghana, Malawi, Togo, Uganda, Zimbabwe	Indonesia, Nepal, Thailand
2	Columbia, Uruguay		Bangladesh, Israel, Vietnam
1	Cuba, Trinidad and Tobago	Algeria, Ethiopia, Ivory Coast, Madagascar, Mali, Nigeria, Somalia, Tanzania	Iran, Iraq, Korea, Lebanon, Palestine, Taiwan

Adapted from IFOAM (2000)

IFOAM members, yet there is no data available for organically managed land within these countries. Many of the organisations affiliated to IFOAM are quite evidently community and/or peasant farming organisations who would be unlikely to have to have much engagement with export markets. Thus the IFOAM Directory arguably provides a more realistic assessment of levels of the existence of non-export oriented OAA within individual countries. Differences between data contained in tables 2.1 and 2, and table 2.3 offer clues as to countries where de facto organic agriculture may be practised on a significant scale.[13]

Such deductive reasoning is useful since there are few other ways of identifying the extent and existence of *de facto* organic farming. Our literature review and survey both strongly suggest that OAA is practised more extensively than official certification figures suggest. Opinions vary significantly (see chapter 3) as to the extent to which *de facto* organic farming is practised, although the balance of views suggests that the amount of *de facto* organically managed land almost certainly outstrips 'certified' organic land, probably by a considerable amount. Informal use of OAA appears to be concentrated in specific countries and particularly in certain types of area (discussed in section 2.3 below). It is often a 'hidden' form of agriculture, rarely the subject of interest from government extension agencies and only sometimes the focus of development and aid projects. It is likely to be oriented primarily towards local and regional markets, which further obscures information gathering as to the extent to which it is practised. In view of these factors, the development of any definitive global estimates of the extent of *de facto* and uncertified OAA is an unlikely prospect in the foreseeable future.

One recent report partially fills this gap by providing estimates of the amount of land managed according to precepts of

'sustainable agriculture'. Pretty and Hine (2001a) undertook a major survey that identified 208 sustainable agriculture projects and initiatives, involving almost 9 million farmers, managing almost 30 million hectares of land on a 'sustainable basis'. The authors estimate that this is equivalent to c. 3% of arable and permanent cropland in Asia, Africa and Asia. Some reservations, however, should be expressed over the comprehensiveness and interpretation of these figures. The great majority (70%) of land that they identified as sustainably managed is under new 'zero-till' and crop cover management regimes which are not necessarily either organic or agroecological. Moreover, as the authors point out, in most instances the 'conversion' to such methods has occurred in the 1990s. Thus the emphasis of this data is very much on 'projects and initiatives', with the inevitable implication that sustainable, agroecological and organic systems that have been developed by farmers, independently of development agencies, extension services or NGOs are likely to remain unrecorded.

In conclusion, large and probably unanswerable questions remain over the extent to which OAA is practised in the South, particularly on an informal basis. In the remainder of this section we turn our attention to identifying the main factors which are driving the growth of OAA, examining the role of external stimuli and the incentives for, and constraints upon, farmers in the South adopting OAA.

2.2 – External stimuli for the development of organic agriculture

In recent years there has been a rapid growth in the interest shown by the South in the potential of OAA. Two thirds of the recent growth in IFOAM membership is due to new recruits from the South (La Prairie,[14] cited in Scialabba & Aubert, 1998). Several vectors of this growth can be identified, market forces being among the most important. Rapidly growing demand for organic produce in the industrialised world is opening up new market opportunities for producers in the South (FAO, 1999; ITC, 1999). In response, a new breed of 'ecological entrepreneur' is emerging, seeking out producers able to provide consistent supplies of organic produce to specified quality standards. This process involves identifying or, in many instances, setting up producer groups who are willing and able to meet this demand. In so doing these entrepreneurs often become involved in areas traditionally associated with agricultural extension or developmental work, providing training, research and sometimes credit facilities.

Many of the entrepreneurs involved in promoting the growth of 'certified' organic produce across the South are based in the industrialised world. Swiss, German, British and Dutch companies and individuals are particularly active in seeking sources of organic produce. Some Southern-based entrepreneurs and community groups are also recognising this potential. However, state support for promoting organic production remains limited to a few countries (notably a few countries in South America, Turkey, Tunisia, Egypt and China).

Few Southern countries have put in place measures to safeguard and support their organic farming systems (i.e. legislation and extension services). Fewer still have developed the capacity to undertake certification activities, and most work of this nature is undertaken by Northern-based consultancies (see section 4.6 for a more detailed analysis of the issues that this gives rise to).[15] Increasingly, trade promotion organisations, such as the International Trade Centre (Geneva) and the Centre for the Development of Industry (Brussels) are becoming involved in promoting and developing organic linkages between the 'First' and the 'Third' worlds.

National and international development agencies are a second force that is encouraging the adoption of organic production in the South. Here the primary concerns are with enhancing food security, increasing farmers' incomes and halting (or reversing) environmental degradation. Such projects often, but by no means always, focus on maximizing use of local resources and knowledge in order to achieve these aims. Some projects promoted under this agenda will be wholly organic, but the majority of such projects are neither explicitly, nor wholly, organic, although they may incorporate significant elements of organic practice within them.

The role of organic farming as a 'development strategy' has been gaining increasing credibility in recent years. In 1996 a UNCTAD report highlighted the role that organic agriculture can play in trade, environmental improvement and social development in the third world. Although the report expressed some misgivings about economic viability and technical feasibility, it concluded that:

'Organic production has an undeniable edge over conventional farming in terms of its beneficial impact on the environment and human health. Moreover, it can also contribute to higher incomes, better food security and creation of employment.'
(UNCTAD, 1996)

The report also commented upon the 'flawed' basis upon which comparisons are made between conventional and organic agriculture, stating that:

'if an internalisation of environmental and social costs and benefits were to take place, organic farming would appear economically justifiable' (ibid.).

Since then the role of organic agriculture has been recognised by FAO, who in 1999 included it within their sustainable agriculture programme , recognising that:[16]

'it plays an important role in developing innovative production technologies, providing new market opportunities for farmers and processors, and generally focusing attention on environmental and social concerns. COAG (the FAO's Committee on Agriculture) will consider the need for an FAO-wide, cross-sectoral programme on organic agriculture that would provide information and discussion forums on production and trade, supply advice and technical assistance, develop standards and use pilot projects to improve organic farming techniques.'
(Eric Kueneman,[17] 1999)

Since adopting organic agriculture within its remit, the FAO has developed a medium term plan intended to raise the profile and support the development of organic farming systems through developing dissemination and networking vehicles, commissioning studies, and providing effective decision support tools (FAO, 2001).[18] However, the FAO's support for organic farming maintains an element of caution. For example, in several publications they argue for partial conversion to offset potential loss of yields.

Other government-financed development agencies are also taking a keen interest in organic systems as a tool for development. In the UK, DfID recently commissioned the Henry Doubleday Research Association (HDRA) to undertake reports into farmer demand and potential for development of organic farming in sub-Saharan Africa (Harris et al.. 1998) and on management of manure in the Kenyan Highlands (Lekasi et al.., 1998). A forthcoming DfID handbook for advisors will contain information on evaluating organic projects. A further publication on the role of 'socially responsible' business as a development tool will include a chapter on organic production (Agroeco, 2001, van Elzakker, pers. comm.)

The German, Swiss, Swedish, Belgian and Dutch government development agencies are all sponsoring research and/or projects, which have led (or are intended to lead) to the establishment of commercially viable export-oriented organic development programmes.[19]

A third driving force behind the growth of OAA is the 'nature conservation' agenda. Though less significant than the previous two, it is still worthy of mention. Our literature survey highlighted a number of examples where nature conservation organisations are working closely with local farmers who live in or close to areas of significant nature conservation interest (see for example, Stein 1996; Flores-Escudero; Panuncio; Pryor; Vreeland, all 2000). Here the aim is to maintain the integrity of landscapes, habitats and biodiversity, and at the same time ensure that local communities are able to maintain or improve their livelihoods. The recent Vignola Declaration and Action Plan (in Stolton et al., 2000a; 2000b) marked the beginning of what may prove to be a powerful coalition of interests between the international organic and nature conservation movements (Stolton & Dudley, 2000). On a commodity (rather than site-specific basis) the World Wide Fund for Nature (WWF) has established a Fresh Water and Cotton project, which specifically addresses the potential of organic cotton farming practices – reflecting concern about the impacts of cotton on water cycles (WWF, 1999; Bärlocher, 2000).

In some respects therefore, we are witnessing a blurring between what might be regarded as developmental/environmental and commercial approaches to promoting OAA. Many of the development and environment agencies are adopting a market-oriented approach in an attempt to secure better market prices for organic produce. At the same time many ecological entrepreneurs are taking on some responsibilities of extension workers, and are providing training, advice and sometimes credit facilities to their producer groups.

2.3 – Towards a understanding of incentives and constraints to 'grow organic'

All these external influences must be considered in the light of how OAA coincides or conflicts with farmers' perceptions of the risks and benefits involved in different farming strategies. In a summary of the potential of organic farming in Africa, Walaga (2000) identifies a range of incentives and constraints on farmers' adopting organic practices. We use this typology as a basis for discussion of the topic in a more global context.

Table 2.4 – Incentives and constraints to organic farming

Incentives	Constraints[20]
Disillusion with 'Green Revolution' technologies and an awareness of the dangers of intensive agriculture, including resource degradation.	Growing rural populations place traditional forms of agriculture under strain and encourage moves towards intensification.
The (increasing) cost of Green Revolution technologies makes them inaccessible to the large majority of farmers.	The high cost of certification (especially in regard to local wages / incomes) undertaken by outside organisations.[21]
Organic farming draws upon (and valorises) indigenous knowledge.	Low literacy levels in rural areas make record-keeping a problem.
The influence of the environmental and development movements has led to organic systems being introduced to combat erosion and desertification.	Lack of trade liberalisation in some countries prevents development of export markets.
Growing awareness that international organic markets offer premia and the opportunity for farmers to increase incomes.	

From Walaga (2000)

2.3.1 – Incentives for adopting OAA

Disillusion with 'Green Revolution' technologies

This is most likely to affect farmers with direct experience of participation in conventional chemical-dependent farming systems that have given rise to what Paarlberg (1994) terms 'second generation rural environmental problems'. These include:

- diminishing returns from repeated pesticide and fertiliser applications
- deterioration of soil and water quality
- health-related problems
- declining groundwater levels
- loss of biodiversity
- increased risk of crop disease.

Part of the problem lies in the toxic nature of many forms of pesticides and fertilisers, but is compounded by inadequate methods of technology transfer. For example, one report from Algeria suggests that only a small minority of hill farmers read and follow instructions that accompany purchased agrochemicals (Moali-Grine, 2000).

The problems outlined above have proved particularly acute in relation to cotton, which accounts for 2.4% of global arable land but 24% of the insecticide market (Bärlocher, 2000). Despite the intensity of agrochemical use in conventional cotton projects, organic approaches to cotton growing have been developed in many parts of the world, creating environmental and economic benefits (see case study 2, over). Another of our case studies, of a tea estate in India, also highlights the health and environmental benefits of switching to organic production. Managers at the Ambootia Tea Estate (see case study 5) identify reductions in respiratory illness amongst the workforce, improvement in the quality of drinking water and the improved stability of steep hillsides as three key benefits flowing from their conversion to biodynamic practices. Second generation environmental problems such as these have often coincided with declines in (or stagnation of) yields obtained from intensive farming practices and/or declining world market prices. Individually, or in combination, these forces are influencing many farmers engaged in commodity-orientated production to jump off the treadmill of conventional agricultural production and convert to more sustainable methods.

Case study 2 – Organic cotton production in India, Peru and Mali

Cotton is one of the most demanding of crops in terms of pesticide and insecticide applications. The effect of these on watercourses, human health and ecosystem diversity has increasingly become a cause of concern (Myers and Stolton, 1999). In many areas cotton pests are becoming increasingly resistant to spraying, and despite increased frequency of pesticide applications, farmers face declining yields. One response is a shift to organic cultivation, as shown in these three case studies.

The Maikaal Bio-Cotton Project, Madhya Pradesh, India

In 1992 an alliance between local farmers, their local spinning mill, sales agents and an organic consultancy set about creating an organic cotton project. Farmers were experiencing severe pest problems, despite repeated pesticide applications: whitefly had developed pesticide resistance and many farmers were abandoning cotton production altogether, due to declining returns and toxicity problems. Government researchers and extensionists were sceptical of the initiative and suggested changing crops rather than method of production. There

were no other certified organic projects in India at the time, and a feeling that the project was attempting the impossible.

In the first year an experimental plot was established at the mill's own small farm, to act as a reference point for farmers. The following year two hundred farmers joined the trial, applying a range of solutions that had been developed through a series of meetings between consultants and farmers. Seven years later more than one thousand farmers, cultivating more than 15,000 acres, have joined the scheme. Organic cotton is the main crop, accounting for around half of this. It is grown in rotation with a wide range of food crops.

An extensive infrastructure has been created to support the project. There is a team of bio-agricultural extension officers located in eight extension centres, which serve between eight and fifteen villages each. Regular monitoring is undertaken and practical and theoretical training is offered to farmers. A range of biodynamic and organic techniques have been developed. These include the use of trap and host crops (the latter to provide habitats for predators), compost making and use of biodynamic preparations. The latter are prepared locally (generating more jobs), and credit for farmers and distribution is arranged. Farmers have a guaranteed market and receive a 25% premia.

Participant evaluation seven years after the project was initiated showed a remarkably diverse set of achievements:

- Average cotton yields on participating farms are on average 20% higher than on neighbouring conventional farms. These tend to increase with length of participation in the programme.

- Yields of other rotational crops (wheat, soya and chilli) are equal to or up to 20% higher than those on conventional land. Sugar cane yields are 30% higher. Sugar mills also pay a premia for the organic cane as it has a higher sugar content. Other products, particularly wheat, attract local market premia because of its superior taste.

- Soils have become softer and more crumbly and do not crack as much in the dry season. Farmers attribute this to composting, which leaves residual fertility in the ground for next year's crop. Composting also reduces the need for weeding, as it reduces availability of weed seeds.

- Irrigation requirements have been reduced due to the increased moisture-retaining capacity of the soil.

- Pest incidence has been reduced to a minimum. Pest control management is now one of the least important discussion topics at meetings. Natural predators are now very common on organic land and farmers have learned how to monitor and encourage their development. Some have developed these techniques so successfully that they no longer need to purchase biodynamic preparations. By contrast, conventional farmers are facing increasing pest incidence.

- Most of the farmers have been using biodynamic preparations on their land for seven years and are happy with the results.

- Labour requirements are substantially reduced and production costs for organic cotton are 30-40% of those for conventional production.

- Given the reduced costs, equivalent / higher yields and market premia, farmers' margins are now significantly higher than before.

- Wider, knock-on effects have been observed. Farmers not involved in the

project have halved their pesticide use. Shops that previously sold pesticides now also sell products acceptable within a biodynamic system, and some merchants have joined the project, solely selling organic and biodynamic inputs.

(Caldas, 2000a; Baruah, 2000)

Organic and native cotton in Peru

Two different ecological cotton-growing regimes are being established in Peru – one in the arid coastal lowlands, the other in the Andes. They have very different characteristics and have been developed for different reasons.

Most cotton production in Peru is in the arid coastal plain and therefore utilises irrigation. Production has been in serious decline, influenced by changing policy, markets, patterns of land tenure and problems with pests and disease. By 1993 production had declined to less than a quarter of its 1963 levels, and yields (per ha.) had declined by 5%. Faced with these problems many coastal strip farmers are turning to organic cotton production. These farmers are achieving yields 10-20% higher than the national average (although not too much should be read into these benefits as this group are considered to be more innovative and productive farmers). By utilising varieties that produce high quality fibre (in terms of staple length, strength, fineness and whiteness) they are able to generate market premia on quality grounds and through use of organic methods have reduced the need to purchase external inputs.

In the High Andes, traditional swidden systems of Native Indians continue to make use of Peru's unique naturally pigmented varieties of cotton, ensuring their survival. Growing cotton in a humid environment at high altitude poses a number of problems and these varieties are arguably best suited to such environments. Low crop density and a shifting pattern of cultivation minimise problems with pests. Yields are relatively low, about half of conventional systems, but cotton is often intermingled with other crops. The unique pigmentation of these varieties, which come in a variety of hues (including greens, browns and purples), offers a potential for generating premia prices, regardless of formal organic status (most of these systems are *de facto* rather than certified organic).

(Vreeland, 1996)

Organic cotton production in Mali

Cotton is a significant cash crop in Mali, contributing 10% of GDP and 50% of export revenues. Mali is the largest producer of cotton in sub Saharan Africa, with more than half a million hectares given over to its production. As in other areas this has given rise to a number of health and ecological problems. In response to these problems, Helvetas (the Swiss Association for International Development) undertook a feasibility study and in the following year initiated trial organic plots involving 10 producers.

Yields in the first year were around half of those on the conventional plots maintained by the same farmers. Methods of pest control using neem extract were experimented with, but were not entirely successful. Input costs were significantly reduced, but labour costs rose. Despite poor yields in the first year, all the farmers involved plan to continue with the scheme, which will be expanded to include 30-40 farmers in 2000.

(Source Valenghi ***et al.,*** 2000)

The inaccessibility of 'Green Revolution' technologies

In many countries the cost and availability of hybrid seeds and agrochemicals has become a major constraining factor on their use. One survey from two regions of Kenya showed that the proportion of farmers using agrochemicals more than halved (from 97% to less than 40%) over the 1990s (Wachira, 2000). This decline is often a direct result of

the removal of state subsidies and other support mechanisms such as distribution (Scoones and Toulmin, 1999, p.60). Much of the literature and many responses to our survey suggest that in many areas (and especially poorer marginal ones with limited market access) the use of artificial inputs is declining from an already low base, almost entirely due to economic circumstance. Harris et al.'s study (1998) of the potential of organic farming in sub-Saharan Africa confirms the importance of this factor. Two thirds of farmers using organic methods said that they did so because they cannot afford fertilisers, pesticides or medicines for animals.

The financial risks associated with agrochemical use can be severe. In India the number of peasant farmers committing suicide because of debt problems (and, in a bitterly ironic twist, often using pesticides to do so), has become a national scandal (Shiva et al., 2000). In another instance we heard of farmers in Tigray incarcerated due to crop failures that prevented them from paying debts on chemicals and seeds (Quinones, et al.. 1997 cited in Scoones and Toulmin, 1999; Edwards, pers. comm.). Such experiences are driving many farmers to adopt a less intensive and often *de facto* organic approach to farming. Without doubt, the largest-scale and most-studied example of an economically driven shift to organic farming methods is that of Cuba (see case study 3).[22,23]

Case study 3 – Cuba: Towards a national organic regime?

Cuba has often been cited as an example of the first country to attempt a nationwide conversion to organic agriculture. These claims may be an exaggeration, but the Cuban experience in shifting from a highly intensive, export-oriented, plantation-based agriculture to a lower input mixed system of farming which embodies many elements of organic practice and meets most domestic food needs is, nonetheless, instructive.

Cuba was driven to make such changes by circumstance rather than choice. The collapse of the Soviet bloc, its main customer for sugar (at rates well above world market prices), meant it was no longer able to purchase expensive inputs or, more importantly, import food to meet domestic requirements (60% of Cuban food requirements were previously imported). In response to this crisis Cuba has developed a number of programmes, which take it at least part of the way down the road to being organic.

One of the key changes made in this respect has been the development of a programme of Biological Pest Control. Cuba had three relative advantages in this field: a strong scientific community, long-standing experience in this field (some biological pest control techniques have been in use since the 1930s) and a research programme that already prioritised this area. As a result Cuba is now without doubt established as a world leader in this area. Solutions that have been successfully developed include:

- *Lixophaga diatraeae* – a parasitic fly used in nearly all sugar cane areas since the 1930s to control cane borer.

- *Trichogramma* – a genus of parasitic wasps used to control lepidopteran pests (butterflies and moths– principally Mocis latipes) in improved cattle pasture and more recently used in tobacco, tomato, cassava and other crop systems to control Heilothis spp.

- *Pheidole megacepheal* – a species of predatory ant used to control the sweet potato weevil, which has an efficacy rate of up to 99%.

- *Bacillus thuringiensis* – a bacteria effective against many lepidopteran pests on a range of crops including cabbage,

tobacco, corn, cassava, squash, tomatoes and improved grassland. It is also proving effective against mosquito larvae that carry human diseases.

- *Beauvaria bassiana* – effective against coleopteran pests (beetles) such as the sweet potato and plantain weevils.

Little reliable data is available concerning the volume of production or the efficacy of these treatments. Their method of production is of some interest, as they are produced in more than 200 'artisanal' production units, spread around the country and specialising in products

required in their area. They employ a mixture of graduate technicians and high school graduates and are probably the only places in the world where 'the sons and daughters of local campesinos make modern biotechnological products for local use' (Rossett and Benjamin, 1996).

This system is not without its weaknesses: quality control can be difficult to manage within a decentralised system, and shortages of raw materials (both natural and manufactured) can hinder production. In the first few years following the US-led embargo, Cuba's crop yields fell dramatically and there were significant food shortages, especially for protein. Since that time there have been marked differences in the success of the different sections of agricultural economy. Production in the private sector (a mix of individual campesinos and co-operatives) recovered rapidly and now exceeds pre-crisis levels. Here, peasant farmers drew upon traditional knowledge (of their parents and grandparents), and the agricultural ministry ran agricultural workshops to help people rediscover (and then disseminate) this knowledge, which has been supplemented by access to new biotechnology in a fruitful marriage of science and tradition.

The highly centralised state farms did not fare well in adjusting to the change to organic agriculture, the logic of large-scale plantations and centralised management being antithetical to the principles of organic management. In 1993 Cuba radically reorganised some state farms into small co-operative production units, still owned by the state and required to meet production targets, but managed on a decentralised basis with surpluses free to be distributed as co-op members saw fit. The number of draft animals (oxen) has more than doubled over the past five years, reflecting the need to minimise fuel imports and providing valuable sources of fertility. In addition, family-run food gardens (Autoconsumos) in cities have become an important source of food supply.

Despite these moves towards a more organic system of agriculture, the system retains a dependency on artificial fertilisers and breaking up a long established mono-crop plantation economy is a lengthy process. Despite this 65% of Cuba's rice and nearly 50% of fresh vegetables are now produced organically. Many of the technological and management practices adopted here may have a broader relevance for other regions and countries. Exports of biocides and technical know-how and the publication of a Journal 'Agricultura Organica', all contribute to Cuba playing a leading role in the organic movement.

(Sources: Rossett and Benjamin 1994, Echevarria et al. 2000a & b; Institute for Food and Development Policy 2000; Scialabba, 2000, Kilcher, pers. comm.)

Valorising indigenous knowledge

The cultural importance of organic agriculture and agroecology lies in their ability to draw upon and validate local and traditional forms and sources of knowledge (Kotschi, 2000). This point is frequently reinforced throughout the literature (especially that of agroecology) and is a theme that frequently occurs within our case studies. A number of important consequences

flow from this. First, it emphasises the importance of participatory development, where 'learning from' farmers is as important, if not more so, than 'teaching' them. Second, it implies an end to unilateral technology transfer from the industrialised North to the South (Kotschi, 2000). Third, it implies an engagement with the value systems of rural communities, which will almost inevitably extend beyond mere issues of agricultural productivity and embrace a whole range of other activities, strategies and values that promote household security. Finally, it promotes and reinforces local culture and know-how and thus helps build community self-confidence and their capacity for addressing other issues (Boshoff, 2000).

The influence of the environment and development movements

The influence of Northern-based development and environment movements has already been discussed above (in section 2.2). We should not, however, overlook the role of indigenous Southern-based development and environmental NGOs. In the absence of proactive government policies towards OAA, NGOs are of critical importance in promoting the uptake of OAA through research, training, education and political lobbying. Section 3 of this report contains numerous examples of the activities of such groups in Africa, Asia and Latin America. Case study 4 (over) illustrates the activities of one national group in Indonesia, which is involved in promoting organic agriculture as well as a range of other 'farmer first' development strategies.

Indigenous NGOs have a number of particular strengths. First, they are established to address specific issues and do so from a culturally rooted context. Second, they are more inclined to have a longer-term perspective on the issues than Northern-based NGOs. Finally, by using local capacity, they are less likely to raise expectations when a project is set up or to create 'project dependency' (Kanyi, Okwudire, Schwarz, all pers. comm.). However, in many cases they are seriously under-resourced. Throughout our survey we received many responses from

Table 2.4. The Sustainable Agriculture and Rural Development Prize

2000
St. Jude Training Centre for Sustainable Integrated Agriculture (Uganda)
Geo Farm (The Philippines)
Program of Ecological Agriculture of GIRA (Interdisciplinary Group for Appropriate Rural Technology) (Mexico)
1999
The Indian Institute for Integrated Rural Development (IIRD) (Maharashtra State, India)
The Infanta Community Development Administration Inc (ICDAI) (The Philippines)
The African Network for Development of Ecological Agriculture together with the Ghana Organic Agriculture Network (GOAN)
1998
ADASF/Gallé (Mali)
CET/CLADES (Chile)
Bio-Dynamic Institute for Rural Development (Brazil)
1997
Egyptian Bio-Dynamic Association (EBDA/SEKEM)
The Sustainable Agriculture Programme (ASAP) in the International Institute for Rice Research (The Philippines)
Harmonie du Développement du Sahel Group (Mali)
1996
Agricultural Renewal Consortium in India for a Sustainable Environment (ARISE)
The Kenya Institute of Organic Farming (KIOF)
The Cuban Organic Farming Association (ACAO)
SARD (2001)

NGOs unable to realise their projects and programmes due to a lack of funding – often, by industrialised country standards, involving very small amounts of money.

Knowledge in the industrialised world of NGO activity in the South can never hope to be complete, but this report has identified a number of different and innovative projects. One Northern initiative to help promote recognition of the achievements of Southern NGOs working in this field (which also provides them with some financial assistance in the form of prize money) is the Sustainable Agriculture and Rural Development Prize (SARD). This prize, initiated in 1997 by a German agronomist, Frederick von Mallinckrodt, is an agroecological equivalent of the 'Right Livelihood Awards' and helps draw attention to the successes and achievements of Southern NGOs (Ecology and Farming, 2001).

Case study 4 – World Food Day Farmers' and Fishermen's' Movement (Indonesia)

This case study focuses on the activities of one Southern NGO, to illustrate how the support and development of organic farming forms part of far broader 'farmer first' rural development strategies. Though organic agriculture is important it is also inextricably interwoven with other development objectives and strategies.

The (Indonesian) World Food Day Farmers' and Fishermen's Movement (WFDFFM) is part of an international movement celebrating the role of, and contribution made by, food producers across the world. It was founded in October 1990 on the first celebration of World Food Day, which coincides with the founding of the FAO. These annual celebrations continue to be a focal, festive event in the calendar, when local, regional and national events are held. These festivals help farmers and fishermen experience a sense of global solidarity. They also act as important publicity and recruitment opportunities.

The main aims of WFDFFM are set out in 'The Ganjurun Declaration'. They include promoting sustainable patterns of production and consumption and, through these, promoting 'total sustainable human development'.

The main activities in which the WFDFFM Secretariat is involved include:

- 'Gaduhan': an initiative that helps poor farmer groups obtain cattle, with the aim of increasing incomes and soil fertility. The WFDFFM loans cattle to farmers groups for two breeding seasons. The progeny are then shared.

- Community-based seed bank: this activity begins by helping develop farmers' awareness of the importance of their seeds. Trial farms / plots are then established with farmers' groups to experiment with seed and plant breeding. Results are discussed after harvest and the favoured crops are saved in a village seed bank. The final stage is that of breeding and distributing the seeds. As well as developing seed banks, this activity also develops local capacity in seed breeding.

- Assistance with organic/sustainable farming: this programme explains the drawbacks of conventional farming systems and provides advice, assistance and visits to demonstration organic farms, so farmers can learn alternative methods for themselves.

- Promoting 'alternative' marketing: through an attempt to build alternative marketing links, based around the Japanese teikei model, adapted to local situations.

- Advocating farmers' rights: WFDFFM

advocate farmers rights in the face of increased pressure from companies seeking to register intellectual property rights over commonly held and used genetic resources.

(Source: Utomo, pers. comm.)

Premia market opportunities

The incentives offered by premia export markets have been explored above, in section 2.2. But there is a potential for domestic markets also providing incentives for farmers to adopt organic practices, although this is limited at present. . Incomes in most developing countries are low and the most pressing issue for many is that of securing access to food. In addition there is a lack of awareness of the potential health issues surrounding intensive agriculture production, a widespread perception that 'all food is organic' and poor infrastructures – all of which contribute to constraining the growth of domestic markets. Strong internal markets for organic produce are beginning to emerge in some countries, most notably Brazil, Argentina and Egypt. . In China there is a growing demand for the half way house of "green food", in which only non-persistent, non-toxic and non-accumulative agrochemicals are used in limited quantities (Li, et al.. 2000). In many other countries (see section 3, below) there are signs of the emergence of a health-conscious organic market and of producers mobilising to meet these demands. In general however, certified organic produce finds its principal outlet (and certainly attracts more substantive premia) in export markets. For farmers (especially small-scale ones), the problems of how to identify and gain entry to these markets represent a major constraint. The potential for developing stronger home markets is illustrated in case study 10 on Sekem in section 4.5.

2.3.2 – Constraints on adopting OAA

The constraints that Walaga (op. cit.) identifies around conversion to organic farming are mostly focused around problems of entry to export-oriented markets (e.g. cost of certification, low literacy levels and lack of trade liberalisation). These can represent real barriers and are dealt with in some detail in sections 4.6 and 4.7. There are a number of other more fundamental constraints to the adoption of OAA, which we address below.[24]

Lack of knowledge

Although the importance of local knowledge as basis for developing OAA has been discussed, there are many situations where such knowledge either does not exist or has been lost. There is a clear difference within the literature between those who emphasise the value, extent and, sometimes, sophisticated level of local understanding of OAA principles and techniques, and those who argue that such knowledge is often partial, incomplete or lacking altogether. In this vein, Harris et al. (1998, p.1) found that:

'Isolated techniques are sometimes practised, (but) there is a general lack of an integrated approach to soil fertility and crop protection management and under-exploitation of the full range of techniques which would maximise the benefits of locally-available natural resources'.

They also reported that more than 60% of farmers claimed that it was lack of knowledge that prevented them adopting organic methods, four times more than for any other single cause (ibid. p. 12). Yet, the same group of authors (Lekasi et al. 1998) in discussing manure management in the Kenyan Highlands also reported that *'farmers reveal an impressive range of ideas for the management of solid manures'.* These apparently contradictory observations suggest that there are a wide range of different pre-existing knowledge levels of OAA, which are likely to be both process and culturally specific. It is certainly not possible to generalise about either a wealth or an absence of indigenous knowledge. However, it would appear that in many

circumstances lack of knowledge, inadequate training and lack of extension facilities act as major constraints to the adoption of OAA.

Economic and political advocacy
Political and economic structures and institutions play a significant role in determining the choices available to farmers and their knowledge of the available options. As mentioned earlier many governments have historically helped subsidise and distribute agrochemicals in order to increase agricultural productivity. Whilst such intervention is generally declining, many governments still exhort their farmers to make use of agrochemicals through media campaigns and the advice proffered by extension workers.

Elias (2000 p.77) quotes the example of Mr. Munae, a farmer in the Ethiopian lowlands, whose farm was used as a demonstration plot by the local extension services. He did his own comparative trials with organic and inorganic fertilisers and concluded that organic inputs were superior. They improved the texture and water retaining capacity of the soil, were locally available and avoided indebtedness. He wanted to stop using artificial fertilisers altogether, but the extension staff forbade him from doing so, or from telling other farmers about his findings, for fear that it would reduce the receptiveness of the local community to the fertiliser package that they were promoting. Whilst this may be an unusual and extreme example, it highlights how deeply ingrained professional and institutional resistance to OAA development can be.

The purpose of this report is not to provide a comparative assessment of agricultural policy in the South. However, such policies clearly impact on the support, both practical and 'moral', that OAA is likely to receive from national and regional governments. The country profiles in section 3 provide some examples of governments who are being supportive of (or sympathetic to) organic farming and agroecology. In areas where pro-OAA policies have been adopted they can make a substantial contribution in providing appropriate research and extension services, creating an affordable regulatory infrastructure and promoting export opportunities. In most instances such governmental interest in OAA is driven by a desire to tap into the economic opportunities that organic produce offers. The non-market benefits, such as natural resource conservation and protecting the livelihoods of resource-poor farmers, are less often realised or pursued (Scialabba, 2000). In many more cases the attitudes of other governments range from the unsympathetic to the outwardly hostile. The perception of the superiority of agricultural 'modernisation' remains a powerful influence amongst many politicians, policy-makers and field workers, and is a formidable barrier to the more widespread adoption of policies that would help the spread of OAA.

The recent recognition by the FAO of organic agriculture as a useful mechanism for promoting sustainable agriculture may go some way to softening attitudes towards OAA on a global scale. On a more localised basis, authorities in some districts and regions where organic pilot projects have been established have been persuaded not o run campaigns promoting fertiliser and pesticide use, in order to avoid sending contradictory messages to the farming community (Edwards, pers. comm.). In other cases, district authorities who were initially opposed to organic projects have subsequently adopted 'pro'-OAA policies where the beneficial results of these projects have been visible (van Elzakker and Tulip, 2000). Despite these small gains, the task of legitimising OAA – which in many circles is seen as representing a reversion to tradition – may prove to be a long and uphill struggle.

One important constraint holding back the

adoption of OAA is the shift in the resourcing of agricultural support services that OAA appears to require. Under the present system, both research and extension facilities can be at least partially underwritten by profits from sales of seeds and agrochemicals. The emphasis of OAA on developing closed cycles and using locally available resources restricts (though does not completely negate) the scope for selling inputs to farmers. A shift to OAA would appear to imply higher levels of public funding to support research and extension work. Yet in many cases these services are already under strain. Badejo, (1998) notes that in some parts of Nigeria the ratio of extension workers to farmers is in excess of 1:17,000. Even where these figures are not so unfavourable, extension workers are often *'poorly motivated, demoralised and over-stretched because of lack of infrastructural support such as vehicles for transportation and inadequate transport allowances'* (ibid. p. 217).

In addressing the issue of advocacy, the role of the agrochemical industries and seed suppliers cannot be ignored. Whilst not wishing to enter into the realms of debate regarding the ethics or business practices of these companies, the strength of their influence on agricultural practice should not be overlooked. They are able to send clear messages to farmers via advertising hoardings and the advice of salesmen and merchants.[25] At the same time they will have a clear interest in influencing government policy to create a climate that is favourable to their trading activities.

2.3.3 – Assessing incentives and constraints according to farm type

The relative contribution of the factors outlined above in influencing uptake of OAA will not be uniform but will vary according to the situations faced by individual farmers. Harris et al.'s (1998) study of sub-Saharan Africa usefully identifies a range of different scenarios likely to affect farmers' potential interest in adopting OAA. These hinge around combinations of two factors: the level of farming intensity and the market orientation of existing systems (ibid. p.7). They identify three broad types of (small-scale) farming systems according to these criteria:

Farmers practising unimproved traditional farming

This group relies largely, if not completely, on fallowing to maintain soil productivity. These farmers tend to be in remoter rural areas where population pressure is low and there is only limited engagement with markets. These farmers have limited access to agrochemicals and are likely to have relatively little motivation to innovate, at least while their traditional systems show no adverse effects. In these situations some scope may exist for identifying and promoting simple organic techniques, especially for enhancing soil fertility.[26]

Farmers engaged with markets and using limited amounts of agrochemicals

This group is thought to be typical of the vast majority of small-scale African farmers. Having reached the limits of productivity through traditional means, the farmers have integrated new technologies (usually agrochemicals) with traditional ones. Use of agrochemicals has been quite limited, and farmers have not normally been exposed to their negative effects and thus have a limited awareness of the comparative advantages and disadvantages of organic and inorganic systems. Many farmers within this group have withdrawn from (or significantly reduced) fertiliser use as prices have risen, but at the same time lack an awareness of how to intensify their use of locally available resources. There is a considerable potential for developing programmes to encourage organic techniques amongst this group.

Farmers practising intensive agriculture

This group relies heavily on agrochemicals,

but also employs 'sophisticated and intensive' organic techniques of soil fertility management. They appear relatively uninterested in adopting exclusively organic techniques, although they are likely to have observed the negative side effects of intensive agrochemical use. There is potential for developing more intensive soil fertility techniques amongst this group, although their interest in adopting OAA may vary according to the cost of artificial fertiliser. This group consider organic pest and disease control methods to be ineffective and further research and more conclusive field trails would be required to convince them otherwise. More strongly market-orientated than the other groups, these farmers would be more likely to adopt organic practices in response to evidence of changing consumer demands.

We find this framework a useful one, but believe that there is a case for including two further categories of farming systems, outlined below.

Traditional intensive farming systems

These systems have often evolved in relatively remote areas where farmers have, by virtue of necessity, developed sophisticated, complex, productive and self-sustaining agricultural systems. These are often associated with 'tribal' and minority cultures. Whilst primarily sustenance-oriented, they also often contain elements of cash cropping. These systems can be regarded as repositories of traditional knowledge, with a potential for transferability. Our first case study, of the Chagga Home Gardens in Tanzania, provides one such example. Other examples can be found in different parts of the developed world including South America and Asia (see for example: Jiménez-Osornio and Silvia del Amo; 1986; Silvia del Amo, et al. 1986; Faust, 1996 and Ross, 1996).

Plantations

At the other end of the spectrum we find traditional export-oriented plantations, usually producing a single commodity. Whilst the monocultural nature of these systems appears to run contrary to many of the principals of organic farming, there are many factors that may encourage plantation owners to consider adopting OAA. As market (and often export) oriented enterprises, they are more attuned to market signals, aware of growing demand for organic produce in the industrialised world, and face the possibility of declining yields (or financial returns) from established systems of intensive cropping. Although a shift to OAA implies a major re-adjustment of the farming system (and the introduction of more diverse cropping patterns), plantations often have the financial and professional resources to experiment with such a transition. The case study of the Ambootia Tea Estate in India (over) illustrates the benefits and problems of undertaking such a conversion.

Summary

A number of complex, interacting factors influence the way in which organic and agroecological farming practices are taking root, or becoming re-established, in the South. On the one hand there are farmers who are consciously adopting organic management strategies in order to gain market advantage or improve food security. On the other hand, there are probably many more who are jumping off the agrochemical treadmill largely for economic reasons, but sometimes due to adverse health and environmental impacts. This latter group represents a clear potential 'organic constituency'. However, their withdrawal from agrochemical use does not necessarily mean that they have the skills or knowledge base to introduce productive OAA. The relative size of this group and the potential that they have for implementing organic management techniques are both relatively unknown quantities.

Case study 5 – Ambootia Tea Estate (Darjeeling, India)

The Ambootia Tea Estate covers 350 hectares and is one of many tea gardens in the foothills of the Himalayas. In common with most other estates it has faced declining yields as a result of over-intensive farming. Depletion of soil fertility and decreased resistance to disease were major concerns. Labour relations were also very poor, as a mudslide had recently destroyed the living quarters of many plantation workers. Faced with these issues a new management team (with a historical association with the garden) decided to adopt a socially and environmentally sustainable approach to the estate and with some assistance have developed a biodynamic management system that also meets fair trade requirements.

Key features of the farming system include:

- use of locally-gathered compost: making 2,100 tonnes of compost per year;
- almost doubling the size of the dairy herd, providing additional milk and manure;
- use of leguminous species to provide nutrients and ground cover and of local herbs for biodynamic preparations;
- extensive tree planting to provide shade and stabilise the hilly land;
- using soil covers and contour planting to prevent run off – the harvesting of the soil cover plants provides compost material;
- promotion of ecological diversity strengthens natural pest control leading to increases in ladybirds which feed on major pests, such as thrips, aphids and red spiders;
- embarking on an extensive programme of pruning and replacing unhealthy plants – pruned areas are treated with BD bark paste, a biological disease inhibitor.

The initial years of conversion saw a 17% drop in output, but this was offset by higher prices achieved through access to fair trade markets. Development of a new pruning regime is beginning to bring yields back to their former level, but it will be some time before this regime is established across the whole plantation. Ambootia Teas now have biodynamic and fair trade certification and new product lines are being developed. With the additional resources two 100KW hydroelectric schemes are in preparation to help meet the Estate's electricity requirements and help stabilise landslide prone areas.

Ecologically, the shift to biodynamic methods has significantly improved immunity to diseases, reduced problems of soil erosion and risk of landslide and increased retention of soil moisture (in an area with very seasonal rainfall). The social benefits have also been substantial. A shift to using local resources has increased labour demand by 35%. Milk supplies have increased, improving workers' diets and allowing them to augment their incomes. The abandonment of pesticide use has helped improve water quality and reduced the prevalence of respiratory diseases.

(Source: Maxted Frost (1997) and R. Bansaal (pers. comm.))

3 – Regional perspectives

This chapter builds upon the information on global organic production provided in section 2.1. It outlines levels of organic activity on the three Southern continents and describes in more detail a range of current initiatives and projects in countries where OAA appears to be attaining a critical mass. These profiles are not comprehensive overviews of all the organic initiatives within the selected countries. Such analysis would require more detailed and in-depth investigation. What it does do is provide a snapshot of some of the high-profile success stories from within these countries. Much of this information, particularly regarding the work of NGOs, was derived from responses to our survey and to our knowledge has not been bought together before.

3.1 – Africa

Africa is the poorest of the continents and the one which has most frequently (and often horrifyingly) suffered from food shortages and famines. Increasing population pressure, diminishing soil fertility and, in many areas, irregular patterns of rainfall combine to create difficult circumstances for farmers attempting to meet present and projected food needs. The 'Green Revolution' has had a limited impact in Africa, and much agricultural production is small-scale, traditional and unimproved. Some argue that the introduction of high technology agriculture into Africa has not only failed to resolve existing problems but has actually made the situation worse, contributing to the rapid development of new kinds of problems. These include:

'marginalization, the raising of export production, a falling level of self sufficiency, and an increase in environmental problems' (Njoroge, 1997)

Yet at the same time, there are also highly productive and intensively-farmed areas producing a range of crops for internal and external consumption. Many countries are highly dependent on overseas earnings from commodity exports and their agricultural policies often reflect this. At present there is very little certified organic production within Africa. Table 3.1 (over) shows the most recent statistics for organic production in countries for which data is available. This suggests that only ten African countries are presently engaged in organic production, and provides details of activity in only seven. In terms of certified land, Tunisia, Uganda, Tanzania and Egypt emerge as the main actors. Madagascar, Cameroon and Egypt fare well in terms of the number of farms and farmers involved. It is likely that these figures were incomplete at the time of publication and, given the growth of interest in sourcing organic produce, are likely to now be quite outdated. Table 3.2 (over), shows that the range of organic produce exported from African states (in 1999) suggest a wider engagement with organic farming than the figures derived from Willer and Yussefi.

Exports to the industrialised world, and in particular Europe, are likely to account for a large proportion of certified organic production in Africa. Domestic markets are relatively underdeveloped due to a combination of low incomes, a general perception that most agricultural produce is organic, and a poor infrastructure. Exceptions to this are South Africa, which has a growing organic market (and imports from neighbouring countries) and Egypt, where Sekem have been at the forefront of developing a strong domestic demand, and market their produce (organic teas, cotton and phytoceuticals) to around 10,000 outlets. Other attempts to develop local markets are being fostered in parts of West Africa (Anobah, 2000; Crole-Rees, 2000) and there is evidence of informal markets developing in Senegal (Anon, 1999).

Table 3.1. Organic Farming Statistics for Africa

Country (date of data)	no. of farms	ha.	% of ag. land	mean farm size (ha)
Cameroon (1999)	303	719	0.01	2.4
Egypt (1999)	220	2667	0.08	12.1
Madagascar (1998)	1000	-	-	-
Malawi (1998)	2	80	0.002	40.0
Mauritius (1995)	3	175	0.15	58.3
South Africa (1998)	35	-	-	-
Tanzania (1998)		4000	0.01	-
Tunisia (1999)	90	8000	0.09	88.9
Uganda (1999)	7000	5250	0.06	0.75
Zimbabwe (1999)	-	1000	0.005	-

adopted from Willer and Yussefi (2000 & 2001)[27]

Table 3.2 – African organic agricultural products on international markets

Product / Country	ALG	BEN	B.F.	CAM	COM	EGY	GHA	I.C.	MAD	MAL	MAU	MOR	MOZ	S.A.	TAN	TUN	UGA	ZAM	ZIM
Avocados														#			#		
Bananas				#													#		
Cashew Nuts													#						
Cocoa								#	#						#				
Coconut		#							#										
Coffee									#						#		#		
Cotton		#				#							#	#			#		#
Dried Fruit		#	#						#			#					#		
Herbs						#			#			#		#		#			#
Honey	#								#	#								#	
Olive oil																#			
Palm Oil									#										
Pineapples				#			#				#						#		
Sesame		#	#							#							#		
Spices															#				#
Sugar											#			#					
Tea															#				
Vanilla					#				#										
Vegetables				#					#			#		#		#			

Abbreviations for countries: Algeria; Benin; Burkino Faso; Cameroon; Comoros; Egypt; Ghana; Ivory Coast; Madagascar; Malawi; Mauritius; Morocco; Mozambique; South Africa; Tanzania; Tunisia; Uganda; Zambia; Zimbabwe.

While some question marks remain over the extent of certified organic farming in Africa, there is more uncertainty over the extent to which de facto organic agriculture is practised. Willer and Yussefi (2000) claim that much agricultural produce sold on conventional markets in Africa is in practice organic, although it is rarely certified as such. The Ghanaian Organic Agriculture Network (GOAN), estimates that there are around 250,000 families in south and east Africa farming around 60 million hectares on an organic basis. GOAN claim that these farmers produce double the average yields of conventional or traditional farmers (cited in Scialabba, 2000). Anobah (2000) estimates that over one third of West African agricultural produce is organically produced.

In contrast, one recent survey of farming practices in sub-Saharan Africa (Harris et al.., 1998) found organic farming to be extremely uncommon:

'We found no examples of organic farming to standards specified in developed countries… There was little understanding of the concept of organic farming as a holistic approach to agriculture… Understanding of the inter-relationships of component parts of the farming system was also limited… However, some farmers did appreciate such interactions and farmers did use organic techniques to varying degrees, but without perceiving this to be organic farming.' (*ibid.* p.2)

The same authors also found:
'Use of agrochemicals is widespread amongst farmers throughout [sub-Saharan Africa]. Amongst [those surveyed] there is little evidence of knowledge and adoption of soil fertility management and crop protection practices of a non chemical nature.'(*ibid.*, p.1)

At the same time we have come across studies and received several responses to our survey which suggest that in many African countries the use of artificial inputs is relatively low.

Whilst these global perspectives cast a somewhat contradictory picture, our impression is that the low use of artificial inputs is due more to the high price of, and/or difficulty in obtaining, fertilizers and pesticides rather than a result of conscious decisions to adopt organic techniques. (See for example Harris et al., 1998, Scooles and Toulmin, 1999; Wachira, 2000). In the remainder of this section we focus upon those countries where OAA is being more consciously promoted, where it appears to be gaining a 'critical mass', and where successful and innovative strategies are being developed.

Burkina Faso was the first African country to host the biennial IFOAM International Scientific Conference, where the Declaration of Ouagadougou, which states that *'organic agriculture in developing countries is not a luxury but a precondition for attaining food security'*, was launched (see Djigma et al.. 1989). Rediscovery of traditional techniques (such as Zaï – see case study 6, over) have proved of benefit in restoring desertified land, improving yields and establishing food security. Their use is now spreading to neighbouring countries. There is evidence of some governmental support for organic initiatives through the Ministry for Peasant Co-operative Action (Ouedraogo, 1989a). In addition a number of NGOs, women's and farmers' organizations are involved in promoting organic, participative agriculture primarily for environmental and food security reasons (Ouedraogo, 1989b). The Ligue des Consommateurs in Ouagadougou promotes organic agriculture and defends consumers' rights (ITC, 1999). More recently a pilot centre for technological training in organic food processing has been set up by AVAPAS under the aegis of the IFOAM OA2002 programme.

Case study 6 – Zaï: A traditional method for restoring degraded land

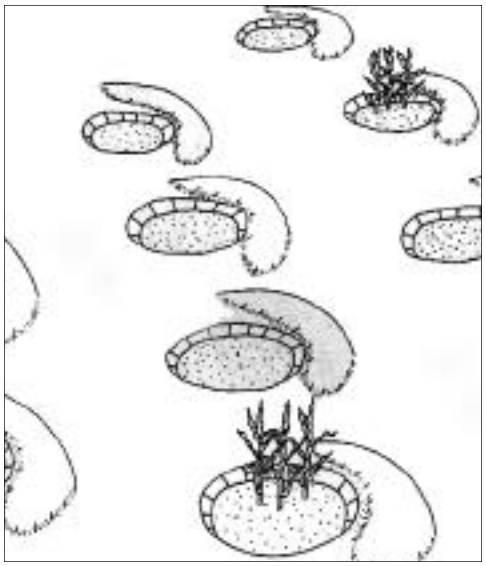
Zaï (or tassa) is a traditional agricultural method used in Burkina Faso to restore arid and crusted areas of fields. The technique involves making seed holes 20-30 cm wide and deep and using the earth to make a raised 'demi-lune' barrier on the downslope side. Compost and/or natural phosphate is placed in each hole and sorghum or millet seeds planted when it rains. This technique improves the organic structure of the soil, helps retain moisture and, through promoting termite activity, increases water filtration into the soil. The crops are planted relatively densely to increase ground cover and prevent water loss through evapotranspiration. Stones removed from the field while digging the holes are often used to make contour bunds to further stabilize the soil and reduce run-off and erosion.

Estimates of the success of this technique vary, but all suggest very favourable results. Ouedraogo (1989a) estimates yield increases of 30-35% and emphasizes the resilience of this system especially in dry years. Other reports suggest that Zaï, combined with contour bunding, can lead to yield increases from an average of 150-300 kg/ha to 440 kg/ha in a dry year and 700-1000 kg in a wet one. Reij (1996) estimates that the families using these techniques move from an average cereal deficit of 644 kg p.a. (equivalent to more than a 6 month shortfall) to a 153 kg surplus.

The system is labour intensive and best suited to farms with a labour surplus. Because of this it is also generating new opportunities for work locally, encouraging some young men to stay in the region rather than migrate to the cities in search of work. In Burkina Faso some 100,000 hectares of degraded land have been restored over the past decade. Use of the technique has largely spread via word of mouth, even to neighbouring countries such as Niger, where some 5,800 hectares of degraded land has been restored using the same technique. Thus this simple and traditional technique is proving of multiple benefit in increasing yields, restoring degraded land and, by generating employment opportunities, helping slow the process of rural/urban migration.

(Sources: Harrison 1987; Ouedraogo 1989a; Hassan 1996; Kassaogué et al.. 1996; Ouedraogo & Kaboré 1996; Wedem et al. 1996; Reij et al. 1996; Pretty & Hine; 2001b)

Figure 3.1 – Illustration of Zaï or planting pit



Source: Kassaogué et al.. (1996)

Egypt has what is probably the most developed organic sector in North Africa. Initial interest in organic production was triggered as a reaction to increasing health problems experienced by farmers and rural dwellers from pesticide poisoning, and cotton yields remaining constant or declining despite increased use of pesticides. Aerial spraying of cotton is now banned in Egypt and much pest control now done through the use of pheromones, even though systems are not wholly organic (Scialabba, 2000).

The NGO Sekem has been responsible for most of the early development of the organic movement in Egypt (see case study 10). It established its first biodynamic farm in the late 1970s and has since helped build up the biodynamic movement. It has established the Egyptian Biodynamic Association, which offers training and extension services for biodynamic farmers and those considering conversion, and an independent certification agency: the Centre for Organic Agriculture in Egypt (COAE). More recently a second organic NGO, the Egyptian Centre of Organic Agriculture (ECOA), was established to promote the organic sector, provide training and support for organic farmers, promote conferences, seminars and research and act as a local certification and inspection body (El-Araby, 1999). ECOA are also establishing an international presence, having recently run workshops and training seminars in Tunisia and Palestine, helped establish an organic project in Bosnia and trained organic inspectors from eight other African countries (ibid.).

Egypt now has more than 200 organic and biodynamic farms, covering more than 2500 hectares. Many of these farms are 'desert' farms, using irrigation from the Nile. They grow a wide variety of crops, including fruit, vegetables, cereals, spices and tea, as well as non-food crops such as cotton and medicinal plants. While much produce is exported, primarily to Europe, there is also strong demand within Egypt and other parts of the Arab world for a number of products. Today the majority of Sekem's production is aimed at domestic markets, which offers it the opportunity to add value through processing rather than exporting commodities. In the early days Sekem's ratio of domestic sales to exports was 1:4. It has now reversed this and only exports 20% of its produce, relying on domestic markets for the large majority of its sales (Abouleish, 2001).

Ghana. The Ghanaian Organic Agricultural Network (GOAN) is a grouping of organic NGOs. They were joint winners of the SARD prize in 1999 and have worked actively with the Henry Doubleday Research Association (HDRA) in developing a range of programmes to support OAA. The Ghanaian government provides some support services, including research, but these are inadequately funded (Scialabba, 2000). The country has a favourable climate and produces a wide range of fruits and vegetables. ITC (1999) claim that there is very limited use of chemical inputs in Ghanaian agriculture and a strong potential for developing a thriving organic sector. There is some demand for organic produce in Accra. Water resource disputes (arising from deforestation and inappropriate farming) led to the establishment of one organic farming project, combined with forestry, nurseries and training. The system brings rewards (premia for organic cashews) and is leading from a shift from slash and burn to sedentary agriculture (Scialabba, 2000).

Kenya has a very active organic sector, with more IFOAM members than any other African country, the majority of these being NGOs. There was a strong response to our survey from Kenyan organizations and a relative wealth of literature and case studies regarding the development of OAA in Kenya. One of the leading organizations in Kenya is the Kenyan Institute of Organic Farming (KIOF), founded in 1987 by Dr. Njorogye in response to the problems of declining yields faced by small-scale but highly intensive and productive farmers in the Kenyan highlands. KIOF's mission is fivefold, including: training, extension, information dissemination, external consultancy and outreach (Stolton, 1997). Methods advocated by KIOF include composting, double deep digging and water harvesting. KIOF offers training and extension facilities and to date it has trained over 200 farmer groups with over 5000 individual members (Ker, 1995;

International Development Research Centre, 1997). Its training programmes range from week-long courses for interested farmers through to a one and a half year certificate course for school leavers.

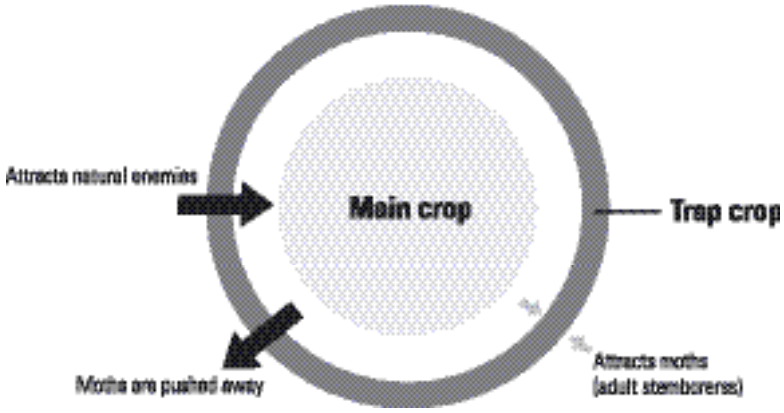
KIOF was one of the first winners of the SARD prize. It has recently been involved in a research project with the Dutch-based consultancy Education Training Consultants to assess the potential and limitations of organic farming in different agroecological and socio-economic conditions within Kenya. Prior to this study it had been assumed that organic farming was most suited to 'high potential' agricultural areas. The study showed that medium potential areas are also very suitable for organic agriculture. This study found that maize cultivation using compost alone fared significantly better than that with manure / fertilizer mixtures (Stolton, 1997). Overall, organic systems were found to be producing good yields, significantly out-performing conventional systems in some areas in terms of grain yields, net cash benefits and returns to labour and capital. It also found that women were particularly drawn to organic farming systems (Scialabba, 2000).

The Association for Better Land Husbandry (ABLH) is another NGO promoting low-cost methods of conservation-based farming. It focuses on developing local skills, knowledge and social co-operation to develop sustainable agricultural systems. Its approach requires nearly no cash investments, but instead considerable initial labour input. It particularly promotes the use of double dug beds, incorporating compost, animal and plant manures. Members of groups working with ABLH find that the investment made in their land provides a better return than taking outside jobs: it enriches the soil and enables them to grow vegetables well into the dry season. One review (of 26 districts involved with the scheme), found that 75% of households have attained all-year food security, and the proportion buying in vegetables has declined from 85% to 11%. Greater continuity of food supply has led to a noticeable improvement in children's health and a reduction in susceptibility to disease (Pretty and Hine, 2001b).

Kenya is also blessed with a number of international research institutes with a commitment to promoting sustainable agriculture. Some of their work is having major impacts in promoting organic farming methods within Kenya and creating initiatives that are being taken beyond its borders. The International Centre for Insect Physiology and Ecology (ICEPE)[28] has done pioneering work in controlling 'stemborer', which causes major yield losses in subsistence cereal production throughout sub-Saharan Africa. It has developed a push–pull system for controlling damage to maize and sorghum. Field margins are planted with 'trap crops' that attract stemborer: the two most successful species used have been Napiergrass *(Pennisetum purpureum)* and Sudan grass *(Sorghum sudanensis)*. The crops themselves are inter-planted with molasses grass *(Desmodium uncinatum)* and two legume species: silverleaf *(D. intortium)* and greenleaf *(S. hermonthica)*.

The International Research Centre into Agroforestry (IRCAF) is currently doing research and extension work on the use of leguminous tree fallows such as *Sesbania Sesban, Crotolaria Grahamiana and Tephrosi.* These species recycle up to 150 kg of nitrogen per tree per annum – enough to significantly increase soil fertility and productivity. IRCAF has also introduced a tree species *(Calliandra calothyrsus)* from Mexico which provides animal fodder at a low cost, thereby increasing milk and manure yields. Farmers who have adopted this species on their holdings talk of a move from 'subsistence' to 'sustenance' agriculture (Collis, 2000). Elsewhere in Kenya, the Coffee Research Council has introduced a species of naturally pest-resistant coffee (discussed in section 4.2) which has now been adopted by one third of small coffee growers.

Figure 3.2 – The push-pull method for controlling maize stemborer



(Source: ICIPE (2001))

According to local sources (Mulagoli, pers. comm.), the emphasis of the government agricultural extension service is primarily upon meeting food security needs, with export promotion being a secondary priority. The government has a long tradition of supporting soil and water conservation measures and since the start of the 1990s has moved towards whole river-basin water catchment strategies, utilizing participatory techniques to engage the farming communities on their own terms (Pretty and Hines, 2001b). Moreover, *'the ministry extension service includes organic farming messages in its training curriculum'* (ibid.). Since 1998 some government programmes have been introduced to provide support for farmers reverting to organic management strategies. This includes the development of 'farmer extension workers' whose plots often serve as demonstration farms. Thus the government's position on organic agriculture is moving from one of hostility to one of support (Wachira, 2000).

Senegal has an active NGO sector with more IFOAM members than any other African country, with the exception of Kenya. The 1989 IFOAM conference in nearby Burkina Faso presented an opportunity for several Senegalese NGOs to publicize their work. Badji (1989) describes an urban rubbish composting project in Louga (population 70,000) in the Sahel. The scheme was developed as a reaction to the declining adequacy of traditional techniques (fallowing, straw burning and use of manure) to cope with pressure for growing more food. Component activities of the project involved collection and sieving of rubbish (93% of rubbish from samples was compostable), experimenting with composting techniques and evaluating the chemical and physical properties of the compost. Though short on qualitative data, the paper notes three main benefits: improved sanitation in the town; creation of a productive green belt, which also protects against desertification; and the creation of new jobs and market gardening opportunities.

Since this time the US-based Rodale Institute has become involved in promoting urban composting schemes in Senegal. It was recently awarded the 'President's National Prize' for work with women's groups on developing composting techniques. It is also involved in regenerating agricultural areas characterized by sandy soils. It conducts projects with around 2000 farmers in 59 groups promoting stall-fed livestock, composting systems, use of green manures, water harvesting systems and rock phosphate. Yields of millet and peanuts have increased dramatically by 75-195% and 75-165% respectively. Because the soils have a greater water retaining capacity, fluctuations in yields are less pronounced between high and low rainfall years.

Thiam and Dieng (1989) provide an account of a market gardening project in the fertile 'Niayes' coastal strip area of Senegal, set up in response to problems of agrochemical use and declining soil fertility. The project includes manuring and biological pest control regimes, field afforestation and

monitoring production data. At the time of writing, more funding had been obtained to extend the project with the aim of disseminating the results through the extension service. Monneveux (1989) reports on a peasant-centred development programme in which local peasants identified the social, economic and environmental pressures that they were facing and introduced a programme of measures to address them. These included the introduction of a composting/manuring scheme, a nursery and tree planting to fence fields – reducing erosion and providing protection against livestock.

Today a number of indigenous NGOs promoting OAA are operating in Senegal. These include Recours à la Terre, which runs a 5 hectares organic demonstration garden and experiments with organic techniques appropriate to the marâichage. These include soil fertility, water conservation techniques and experimentation with species that provide protection against salt winds. It has engaged in joint projects with the Institut de Recherche Agricole on the use of *Sesbania* (a nitrogen fixing bush species), the banana producers group of Senegal and regional producer groups (Sarr, pers. comm.) Elsewhere the Federation des Agropasteurs de Diende is engaged in experimenting with improved composting techniques (including the use of fish meal) and in developing rice cultures in saline and poor farming areas (Gueye, pers. comm.). In addition Senegal is the home of one of the regional offices of Agroecol, a centre which gathers and disseminates information about OAA across West Africa. .

South Africa has had an organic farming movement for many years, although it has grown in 'fits and starts' (Geernat, pers. comm.). The leading organic organization is the Biodynamic Agricultural Association of South Africa. The government is committed to promoting intensification but has also issued draft legislation to enable organic and biodynamic certification. Local efforts are afoot to set up a national certifying body to reduce costs. A few larger farmers are now beginning to get involved as they recognize opportunities here, but few smaller farmers are pursuing this approach, seeing conventional intensification as the line to success (ibid.). South Africa is also a market destination for organic produce from nearby southern African states, particularly Mozambique.

There are also several NGO projects of interest, most with an emphasis on building food security. Auerbach (2000) describes a pilot project in which an existing wetland has been used as a reservoir, yielding enough water to irrigate 3 hectares of previously rain-fed land. Combined with organic management practices (composting and mulching), farm income increased from 1,000 rand to 30,000 rand per year. This pilot project is now being extended to sixty-five other sites within the same river catchment area.

Boshoff (2000) describes the activities of the Food Garden Foundation, which encourages poor households to adopt trench gardening methods using domestic and locally-available compost materials. Their activities help provide food security, improved health and additional income to almost 300,000 people in Guateng Province (one of the poorest in South Africa). The programme also helps restore soil fertility, conserve water and empowers people.

Tunisia is trying to take advantage of its proximity to the EU market. It has developed standards that comply with EU ones and established a national commission for organic agriculture. Budget allocations include help with up to 30% of investment costs to farmers and 70% of certification costs over the first five years. One constraint faced within Tunisia is a poor supply of organic

fertilizer, but research is being undertaken as how to best utilize waste from the food processing industry (Scialabba, 2000)

Uganda is highly dependent on agriculture, which accounts for 45% of GDP, and employs 80% of the population. Coffee is a major crop, accounting for 40-70% of export earnings. In the past, political instability over two decades hindered agricultural modernization, and in consequence fertilizers and pesticides are not widely used except on tea, coffee and other export crops (e.g. tomatoes and salads). In general, most farms are small-scale and organic by default. Many small farmers do not keep livestock and therefore face a problem in building and maintaining soil fertility. The government is deeply committed to modernizing agriculture, to drawing it out of subsistence mode, eradicating poverty and increasing capacity for agri-food processing. However, they intend doing this along a conventional high input/output model. At the same time state support is being cut back, so responsibility for extension will fall increasingly to the private sector. These elements of policy are antithetical to the development of an organic movement which feels it could otherwise fill the government's objectives of reducing poverty and hunger. The task facing the organic movement in Uganda is to convince the state and farmers not to go down this path but to focus on developing natural methods of building soil fertility and controlling pests (Wajje, 2000). The Ugandan organic movement held its first conference in January 2001 to mobilize support and unity across the sector. It intends to set up a certification committee, which aims to develop domestic capacity for standard setting and certification.

Organic coffee, sesame and cotton are already grown and exported (van Elzakker and Tulip, 2000). One project, run by the the Lango Co-operative, has more than 12,000 farmers in 266 villages involved in growing organic cotton and sesame over more than 100,000 acres. This project was initiated by a foreign development agency but has experienced problems through growing too fast. For example, it has had problems in securing access to markets and providing sufficient infrastructure – both in terms of storage and processing capacity and extension facilities. Management of the project has recently been taken over by Bo Weevil who are trying to put the project back on a sound footing and seeking the necessary finances to provide the infrastructure to meet the expectations of farmers who have converted to organic production. The Ugandan organic movement believes that 10-15% of Uganda's coffee exports could realistically be certified as organic within 5-10 years (Wajje, 2000), but the lessons of Lango show it is not only the farming element that needs to be developed in order to establish successful schemes.

There is also a strong NGO sector promoting organic agriculture within Uganda. Luyiga (1997) identifies thirty NGOs directly involved in this field. Church organizations (of a number of different denominations) are heavily represented and play an important role in fostering rural development. The Department of Social and Economic Development (SED) is one such organization. It runs an organic demonstration farm and has trained over 300 animateurs and almost 1600 farmers in soil fertility techniques, soil and water conservation, agroforestry, pest control methods and the role of livestock. Those who have been involved in the project have noticed increases in food production and household nutritional status (Luyiga, 1997). Other NGOs include the Anziaceni Integrated Rural Development Project in Arua, which works with school drop-outs – teaching them the principles of sustainable agriculture and environmental protection – and the Bukonzo Sustainable Agriculture Development Association, which promotes organic dairy farming in Kasese (ibid.). More

recently the Kulika Charitable Trust has relocated to Kampala, where it intends to provide year-long training courses in organic methods (Cadoret, pers. comm.).

3.2 – Asia

Asia is the world's largest and most populous continent. Many areas, particularly in the south and south-east, are densely populated and there is high pressure on land use. 'Green Revolution' technologies have taken root in these countries to a far greater extent than elsewhere and in consequence a shift to organic agriculture may be more problematic than in other areas. Willer and Yussefi's figures (2001) show that Asia's share of global organic production is very small, although this is almost certainly a gross underestimate of de facto organic production.

Table 3.3 (over) shows that Turkey has the most developed organic sector, with more than twice as much land in organic production as any other Asian country. Limited as they are, these figures suggest that in general, holding sizes are small: 5 hectares or less in all cases except the Philippines. ITC's report (1999) suggests that organic production is more widespread than the data that SÖL has collected, although this mostly occurs on a very small scale.

Data on IFOAM members (see Table 2.4) roughly corresponds with these statistics. India has by far the highest representation of IFOAM members (39), followed by China (16), the Philippines (9), Turkey (7), Sri Lanka (6), Malaysia (5) and Pakistan (5). ANGOC's Directory (1997) of NGOs involved in promoting sustainable agriculture reveals a somewhat different pattern, with other countries having a high level of NGO activity: Thailand (with 41 identified NGOs), Cambodia (23), the Philippines (20)[29], Bangladesh (14), Nepal (9) and India (8).

Although the formal organic sector in Asia is relatively undeveloped at present, there are signs that it is a rapidly growing area of activity. China, India, Malaysia, the Philippines and Thailand are all working towards establishing national standards in order both to facilitate export opportunities and to satisfy domestic demand. Organizations in China and Thailand are among the few from the South to have applied for IFOAM accredited certification status (IFOAM, 2001).

Table 3.3 – Organic farming statistics for Asia

Country (date of data)	No. of farms	ha.	% of ag. land	Mean farm size (ha)
China (2000)		8508	0.002	
Hong Kong (2000)	8	122		15.25
India (1999)	304	1711	0.001	5.0
Japan (1999)		5083	0.09	
Kazakhstan (1998)	20			
Rep. of Korea[30] (1998)	1,237	902	0.04	0.73
Lebanon (1999)		100	0.03	
Papua New Guinea (1995)		4625		
Philippines (1999)	9	95		10.6
Sri Lanka (1999)	172	550	0.02	3.2
Taiwan (2000)		1240		
Turkey (1997)[31]	7,500	18,000	0.05	2.4

adopted from Willer and Yussefi (2000 & 2001)[32]

Japan represents one of the largest global markets for organic produce, estimated at $3 billion (Masuda, 2000), much of which is imported. This represents an important market opportunity for south-east Asian organic producers. Japan's organic sector has its own individual characteristics, with ten certifying bodies all employing different standards. It also has a tradition of community-supported agriculture schemes called teikei, which provide very strong links between producers and consumers (Hashimoto, 2000). Teikei systems are reputed to have more than 1 million regular customers (more than 1% of the population), yet have no formal certification processes, relying instead on mutual trust. They potentially provide a model for alternative ways of developing organic markets based on close personal contact and mutual trust, which avoid the need for certification processes.

As in the previous section we provide here a number of 'snapshots' illustrating initiatives and developments in OAA in a selected number of countries. These profiles draw on published and 'grey' literature and responses received to our survey.

Bangladesh has been facing a situation of stagnant or declining yields for a number of years, despite increasing fertilizer application. Proshika, a local NGO, has been trying to introduce agroecology to the country since 1976. By 1988-99 around 10,000 farmers had received formal training in ecological agricultural practices. Proshika finds that the issues involved in promoting agroecology are complex. There is limited availability of fuel for cooking, which places competing and more urgent demands on manure and crop residues. Proshika encourages farmers to use green manure crops, compost, quick compost, rice straw and water hyacinth as alternative methods for developing soil fertility. There is also a move to afforesting farmland to provide fodder, fuel and living fences (Hussein, 2000).

China. The growth of organic agriculture in China in recent years has been phenomenal. According to Chinese sources, certified organic production (which was non existent in 1995) now exceeds 40,000 hectares (Organic Food Development Centre- OFDC, 2001). There are now more than 100 enterprizes certified as growers, processors or exporters (ibid.), producing nearly 100 varieties of organic produce (OFDC, undated). There are several dedicated organic processing and export companies. Zhengfang and Wei (2000) estimate that around 10,000 farming families in China are now involved in organic production and that the current export value of the organic sector exceeds £12 million, and shows an annual growth rate of 30% (OFDC, undated).

China is in the unusual position of having two separate certification systems, run by two different government departments. 'Organic Food' is run by the Environmental Protection Agency. The Ministry of Agriculture runs 'Green Food', a scheme with two categories: 'A' which allows limited agrochemical use (if of low toxicity and persistence), and 'AA', equivalent to IFOAM basic standards (Li, et al.. 2000). While the two schemes were set up separately, there are indications that the two agencies are now working more closely together.

The OFDC have established an eight year collaborative programme with the German Development Agency (GTZ) developing national certification and labelling programmes, providing extension and training services and building links with agricultural universities (OFDC, undated). To date, branches have been established in 18 provinces and demonstration farms in 28 provinces. In addition they have organized seven national workshops on organic food development and four training courses for organic inspectors (OFDC, 2001). They publish two quarterly magazines (Organic Food Times and Organic Fields Newsletter).

A separate organic food advisory centre was established in 1999 to provide research and advisory services.

China's interest in developing an organic sector is primarily driven by a desire to increase foreign earnings. However, there is also recognition of the environmental and poverty alleviation benefits implicit in adopting OAA. To date, state-initiated projects have attempted to avoid areas where there is intensive agrochemical usage, focusing upon areas where the social benefits will be greatest and conversion less problematic.

The development of a viable organic agricultural sector is not without problems, even when the state is able to mobilize considerable resources and draw upon the legacy of a network of co-operatives with established chains of command and often common processing and/or marketing facilities. The costs of certification represent a major problem, as do the differing requirements of different certification bodies. Literacy levels and requirements for translation also raise handicaps to the effective communication and dissemination of ideas (Zhengfang & Wei 2000). In addition, there is a need to strengthen technical support. The physical remoteness of much of rural China makes it difficult for many areas to engage with export-oriented production (Lamin, pers. corr.). There is a significant potential for developing this organic production. ITC (1989) suggests that 30% of the tea from Anhui and Zhejiang provinces could relatively easily be converted to organic produce. One Chinese company, Chaoda Modern Agricultural Holdings Ltd, intends to promote high technology biological farming and through this *'become the flagship of China's agriculture strategy and to rank among the 500 largest enterprises in the world within ten years'*. Its current plans include trebling the amount of land it currently has in organic production by the end of 2002 (Chaoda Modern Agricultural Holdings Ltd, 2000). For the Chinese the allure of premia markets in the developed world is clearly a major incentive for shifting towards organic production.

India. In some respects India can be regarded as one of the homes of organic agriculture. At the turn of the century Lord Albert Howard, a colonial administrator who was sent to India to help 'modernize' agricultural techniques, developed an interest in traditional Indian agriculture. He returned to Britain a convert to natural farming practices, going on to become one of the founders of the Soil Association (Research Foundation for Science Technology and Ecology and Navdanya, 2000). Equally the concepts of organic agriculture resonate strongly with traditions of Ayurvedic medicine and the Gandhian philosophy of 'sarvodaya', which emphasizes self-reliance (Daniel, 2000).

At present India does not have any formal certification system in place, and produce destined for export is mostly certified by external agencies.[33] Initial discussions have taken place between the government and producers, processors and exporters, but the establishment of a fully-fledged organic agency is expected to take several more years (Sathayanarayana, 2000, Wai, pers. comm.). For the time being the Indian government has placed responsibility for developing the organic sector with the Agricultural and Processed Foods Export Development Authority (Mohan, pers. corr.), a decision which speaks volumes about how the government perceives the role of organic farming in India. Other export-focused agencies, such as Indian Spice Board and the Tea Board of India, are already supportive of organic farming – having recognized its earning potential. Some specialist groups have recently emerged, such as the Indian Bio Tea Organization and the Peermade Development Society, an organic spice farmers consortium based in Kerala (George, 2000).

India has a number of high profile, large scale organic production facilities and networks. This report profiles two Indian case studies – the Ambootia Tea Estate and the Makaii bio fibre project. Other significant projects include:

- The Dooars Tea Plantation in Bengal, producing half a million kilograms of tea p.a. (Mohan, pers. corr.);

- The Peermade Development Society, whose membership has risen from less than 200 to more than 1000 between 1997 and 1998 (George, 2000), and;

- Enfield Agrobase, a private company in Tamil Nadu, with 175 acres of organic farms. At present this group of farms grows cashews, mango, coconut, sugarcane, groundnut, sesame and paddy rice and maintains a herd of fifty cattle for milk and manure. The farms have established facilities for processing jaggery from sugarcane, for processing coconut oil and shelling and grading coconuts. They intend to expand to 500 acres in the next year and to establish facilities for processing cashews. All of their produce is presently aimed at domestic markets as they feel that they are too small to compete on international markets (Rao, pers. comm.).

Such examples represent only the most visible facet of organic production within India, and are almost certainly only the tip of the iceberg. Despite official support for the 'Green Revolution', traditional farmers have maintained a resistance to adopting such techniques. In such a vast and varied country it is difficult to estimate the extent of de facto organic production, especially as such forms of agriculture have been neglected by development and extension services. Some responses to our survey suggest that de facto organic farming is extremely widespread. One survey respondent estimated that 40% of farmers (i.e. 5 million) in his part of Bihar farm organically, a practice assisted by the annual flooding of the river (the Nepli), bringing tons of topsoil from the Himalayas and providing a convenient, if not sustainable, source of fertility (Prakash, pers. comm.). Venkatesh (in Institute for Integrated Development, 2001), estimates than only in one in five dryland farmers in India use chemical inputs, the great majority relying upon manure and green compost for maintaining soil fertility.

Notably India has almost twice as many IFOAM members as any other developing country, and a large majority of these are NGO advocates of OAA, working to develop technical, advisory and logistical support for India's farming community. The Institute for Integrated Rural Development in India is one of the main NGOs involved in promoting OAA. It provides training and extension services, runs a three year diploma course in organic agriculture, and has been involved in setting up local organic food markets. In January 2001 it promoted the first all-India Organic conference (ibid.). The Research Foundation for Science, Technology and Ecology adopts a more overt lobbying role and has published a series of publications questioning the wisdom and sustainability of chemical-dependent farming practices (Shiva et al. 2000, Shiva, 2001).[34] It also promotes organic practices, particularly the maintenance of biodiversity through seed exchange networks (Shiva et al. 1995). We received reports about a recently published all-Indian directory of NGOs engaged in sustainable agriculture, but were unable to locate this.

Some local commentators (Mohan, pers. corr., Faisal, pers. corr.) criticized the lack of resources made available to conduct scientific research into technical aspects of organic farming. Whilst not doubting that this is an under-resourced area we did nonetheless find evidence of some significant research capacity and interest in this area through

independent institutions and the academic community. The Central Arid Zone Research Institute (CAZRI) in Rajasthan has undertaken work in encouraging the development of organically grown medically beneficial plants (Sharma, 1998) and in integrated resource management for sustained crop production (Gupta and Agarwal, 1992). The Central Research Institute for Dryland Management in Andhra Pradesh has also undertaken research on green manuring (Reddy et al.. 1991). Gupta and Patel (1992a & b, 1993a & b, 1994, 1995, 1996, all cited in Stoll 2000), have written extensively about farmer innovations in Gujarat State. A Bangalore-based NGO (Agriculture, Man and Ecology) is centrally involved in IFOAM's global research programme in the sustainability of different farming systems in different parts of the world (Chinnakonda and Lanting, 2000). A recent Tamil language publication (Srinavasan et al. 2001) argues the case for eco-farming and provides detailed examples of crop and pest management.

There is some evidence of a growing domestic demand for organic produce (Baksi, 2001). Most trade in organic produce is done on the basis of 'self- certification' and mutual trust (Prakash, pers. comm.), although more organized attempts at building more visible outlets for organic produce are now emerging (Daniel, 1999; Sathayanarayana, 2000). With a substantial middle class there is undoubtedly a potentially large demand for such produce.

Nepal is a remote and landlocked kingdom, with one of the lowest levels of per capita GDP in the world. Significant proportions of the population are rural based and dependent upon agriculture for their livelihoods. According to Sharma (2000), agricultural productivity is in a state of decline. Government response to this problem appears very mixed. On the one hand the state has adopted plans to increase use of artificial fertilizers sixfold over the next 20 years. On the other it has recognized the adverse environmental effect of such chemicals and has stated that it will not encourage farmers to use hazardous pesticides (Ghimire, pers. comm.). The desire to avoid the use of pesticides has led to the creation of Integrated Pest Management (IPM) schools being set up in 26 districts (Sharma, 2000).

One criticism of state agricultural policy is that it is nationally focused and does not pay sufficient attention to the significant regional variations that exist within Nepal. For example, the intensity of farming varies significantly between the upland areas, where forestry resources can be drawn upon, and the intensively populated and cultivated plains, where farms have to rely more upon farm sources for building soil fertility (ibid.) Equally these different farming systems have different levels of market engagement. In remote upland areas transport and communication networks are virtually non-existent and the exchange and bartering of commodities within and between communities is the main form of exchange. Lowland areas have a stronger engagement with markets and some non-certified organic produce is traded, particularly to the tourist and hotel sector in Kathmandu and other popular destinations. Only very limited amounts of high value produce (e.g. tea, coffee and spices) is certified and traded internationally (ibid.).

One of the main NGOs promoting OAA is the Ecological Services Centre, which claims to have worked with more than 10,000 farmers. The approaches that it promotes vary according to agroecological zones. In hill regions, where significant 'off farm' resources may be used, the emphasis is on agroforestry, homestead gardening, composting, green manuring and natural pest control. In lowland regions, soil fertility management through composting and green manuring and natural pest control methods

are the main priorities. Other organizations involved in promoting OAA in Nepal include the Institute for Sustainable Agriculture, the Permaculture Group and the Nepal Community Support Group (ibid.).

Sharma suggests that significantly improved yields have been obtained through conversion to agroecological approaches, quoting increases of up to 175% in some instances. However, details of crop types and changes in management practices are not provided.

The Philippines. The formal organic sector in the Philippines is small. It does however produce around 20,000 tonnes per year of organic coffee (Cannono, 2000) and some muscovado sugar (Haessig Alle, pers. comm.). Some coffee and sugar is also produced under fair trade labels. Some vegetables, fruits and dairy produce are produced for local consumption, although rarely certified as organic. The main markets are within and around Manila (ibid.), although production is still on a small scale, it is growing at 10-20 % per year and could be substantially accelerated by government support (Canono, 2000).

Interest in OAA is largely driven by *'NGOs, eco-friendly advocates and religious organizations' (ibid.)*. Most of the research in alternative farming methods, training, extension and marketing activities is being done by NGOs and farmers' organizations. Publicly-funded research institutions and universities remain firmly rooted in research, development and extension for conventional agriculture and, more recently, supporting the commercialization of GM crops (Briones, pers. comm.).

There are numerous self-help groups in the Philippines practising OAA. They include: BIND, which is working with peasant farmers in Negros Occidental, providing credit facilities and training in ecological pest management, lowland rice cultivation, composting and recycling. More than 500 families are involved in the projects and around 2000 hectares have been converted to organic methods (de la Merced, 2000). MASIPAG has initiated a farmer-scientist partnership since 1986, which works directly with small farmers on alternative ways of conducting research, training, education and marketing. The British VSO program is also involved in sustainable agricultural activities (Briones, pers. comm.) The International Institute for Rural Reconstruction, set up in 1960, also exists to promote OAA. Wai identifies several exemplary Filipino NGO initiatives, including Agtalon, AVDF and Alter Trade. Sampson et al. (2000), report on a project in Negros, where a group of former hacienda workers bought their estate and have converted it to a green village using organic agriculture.

Responses from the Philippines indicated that although there is an impressive array of NGOs actively promoting OAA, the sum total of their efforts does not make much impression in such a large and populous country. This is especially the case since most funding remains directed toward the promotion of conventional and industrial agricultural production (Briones, pers. comm.). Assistance with setting up domestic certification capacity is regarded as a high priority by those in the commercial and NGO sectors (ibid. and Haessig Alle, pers. comm.).

Thailand. Organic farming in Thailand emerged in the 1980s as a grassroots farmer reaction to the effects of chemical-dependent farming (Phinthupan, 2000). It is part of a broader agenda for developing alternative forms of agriculture, which includes more sustainable and equitable (i.e. fair trade) approaches. The Alternative Agriculture Network, which has 85 member NGOs, has created Organic Agriculture Certification Thailand (ACT) to establish a domestic benchmark for organic produce. Green Net was set up as an alternative trading organization in 1994. It handles over 300

product lines, including organic food, handicrafts and fair trade products. The volume of fair trade rice that it exports has increased from 15,000 to 225,000 tonnes per annum over the ten years leading up to 2000. It is also promoting fair trade projects with producers of soy beans, organic vegetables and palm sugar (Panyakul, 2000). Organic production in Thailand is still relatively limited. Phinthupan (2000) identifies 85 certified organic farmers, managing 160 hectares with a further 90 hectares in conversion, although the number farming on a de facto basis is certainly larger than this. The Bangkok Post recently ran an article outlining the development of organic farming in Chiang Mai Province. Assisted by the Thailand Research Fund, the group is attempting to develop mixed organic farming systems, local outlets and is seeking certification. This report illustrates the difficulties as well as benefits of changing production methods, as many farmers have become disheartened by their initial lack of progress. Those who have stuck with the project are beginning to enjoy the benefits of a more productive system, safer food for their families and premia on local markets (Anon, 2000a).

Elsewhere in Asia, **Sri Lanka** appears to have a relatively well-developed organic sector, with more than 4000 smallholders currently engaged in certified organic production, mostly of herbs, spices, fruits, nuts and tea (Williges and Sauerborn, 2000). There are also several NGOs, such as Gami Seva Sevana and the Nagenahiru Foundation, involved in promoting organic practices as a form of rural development strategy (Wai, pers. comm., Emmanuel, pers comm.). There are also signs of emerging organic movements in **Korea** (Anon, 1995), **Malaysia** (Singh, 2000), **Pakistan** (Wai, 1995) and **Vietnam** (Caldas, 2000b).

In the Middle East a number of initiatives are underway. In **Turkey**, the government has increased its policy interventions to support organic production and trade. Working to EU standards, it has independent certification status and a dedicated research group (Scialabba, 2000). In **Iran**, concern about levels of pesticide use (as residues are inhibiting exports) has led to a phased withdrawal of subsidies on their use. The government has undertaken a feasibility study on global organic agriculture to test its relevance to Iran and established a National Committee to consider the type of support to offer peasants (ibid.) One group of producers in Iran is involved in manufacturing rose water. Previously involved in poppy growing, they now find that organic production is more profitable (Hardy, pers. comm.). In the **Lebanon**, the Middle Eastern Centre for Transfer of Alternative Technology (MECTAT) is trying to encourage the growth of the organic sector. It is an active member of IFOAM and is applying for EU development aid to help establish an organic sector (Ghougassian 2000).

3.3 – Latin America

As indicated earlier, Latin America has the most developed organic sector in the South. Table 3.4. provides more detailed information about numbers of farms, land under organic management and average farm size.

Argentina stands apart from the other Latin American countries with 3 million hectares of land under organic management. This makes it the country with the second largest amount of organically managed land in the world after Australia (Willer and Yussefi, 2001). Other countries in Latin America with substantial amounts of organically managed land include Brazil and Mexico, both of which have more than 85,000 hectares. Costa Rica and Surinam both have more than 0.25% of their agricultural land under organic production. Notably there is relatively little recorded certified land in the Caribbean, where there is reliable data for only three countries.

Table 3.4 – Organic farming statistics for Latin America

Country	no. of farms	total ha.	as % of ag. land	mean farm size (ha)
Argentina (2000)	1,000	3,000,000	0.22	3000.0
Bolivia (1997)	3	8000	0.02	2666.7
Brazil (1999)	1,200	100,000	0.04	83.0
Chile (1998)	200	2,700	0.02	13.5
Colombia (1999)	185	202	0.0004	1.1
Costa Rica (1995)	4,000	9,000	0.32	2.3
Dominican Republic (1997)	1,000			
El Salvador (1996)		4,900		
Guatemala (-)		7,000		
Mexico (2000)	27,282	85,767	3.1	3.1
Nicaragua (-)		1,400		
Paraguay (1998)		19,218		
Peru (1999)	2,072	12,000	0.04	5.8
Surinam (1998)		250	0.28	
Trinidad and Tobago (1999)	80			
Uruguay (1999)	150	1,300	0.01	8.7

adopted from Willer H. and M. Yussefi. (2000 & 2001)

Latin America exhibits great contrasts in terms of the size of organic holdings, reflecting in large part the highly inequitable distribution of land, which is a feature of much of the continent. In some countries the average size of holdings under organic management is extremely large – cocoa plantations of more than 3,800 hectares in Bolivia, and average unit sizes of 3000 hectares in Argentina (mostly due to the large size of organic ranches in the pampas). By contrast, average organic holding sizes in Colombia, Mexico and Costa Rica are all under 2.5 hectares. Farmers working on these very different sized holdings face disparate challenges in their agricultural and marketing practices.

Much Latin American agricultural production is export-orientated (Berdegué & Escobier 1997) and this is reflected in the organic sector (ITC, 1999; Willer and Yussefi, 2001). The main organic export crops include cane sugar, cocoa, coffee, cotton, fruits, grains, maté, dairy and meat products, honey and wool (ITC, 1999). Organic production has developed especially rapidly in Argentina, with a fifty-five fold increase in the past decade. Mexico and Brazil have also seen a rapid development in their export markets. The Interamerican Development Bank (Banco Interamericano de Desarrollo), has recognized the importance of the organic sector, recently publishing a report on the sector as part of its Global Project series (Marsden et al. 2000). Though primarily export-orientated, there is growing domestic demand (O'Connor and Silva, 1999) and many supermarkets, especially in Argentina and Brazil, stock organic produce. In other areas local markets and box schemes provide links between consumer and producer. There is currently much sociological interest in the mechanisms being employed to develop links between consumers and producers (Florit 2000; Fonseca et al. 2000a; Fonseca and Teixera, 2000; Guivant et al., 2000; Paula et al.., 2000). For small-scale producers, especially

those in more marginal areas and often lacking formal certification, the challenge of how to successfully market ecological produce is a pressing one. Many innovative forms of association and co-operation are emerging as small-scale farmers group together to find economic ways of marketing their produce.

The profile of IFOAM members within Latin America shows a higher proportion of commercially-oriented organizations than for Africa or Asia. This is largely due to higher levels of engagement with export markets, but also partly due to the fact that many NGOs in Latin America involved in promoting OAA align themselves more readily with agroecology networks rather than the 'formal' organic movement (Barkin, pers. comm.). While there is considerable data available on certified organic production, there is much less on agroecological production which has yet to be subject to 'comprehensive or systemic' studies (Wilkinson, pers. comm.). Latin America has a long-standing tradition of de facto organic agriculture which dates back at least two millennia through the Inca civilization and beyond. Many native Indian peoples are now consciously aligning themselves to the organic and agroecological movements, recognizing the market opportunities and renewed self-respect that they bring.

Altieri (2001) provides some examples of the range and effectiveness of de facto organic agricultural systems being promoted by NGOs in Latin America. These initiatives now involve almost 100,000 farming families/units and cover almost 1.5 million hectares of land. Specific projects identified by Altieri include the following:

- A project in the Honduras, which emphasized soil conservation practices such as drainage and contour ditches, grass barriers and rock walls, and the use of organic fertilization methods and led to a tripling or quadrupling of yields. The 1000+ families participating in the project have seen their production increase to a level sufficient to meet their annual food requirements, and other local NGOs are now adopting and disseminating these techniques. This is beginning to have knock-on effects, enabling farmers to diversify from staple to cash crop production, raising wage levels by 50% for the landless and near landless and reversing a long-established trend of rural out-migration.

- The re-establishment of traditional patterns of Incan agriculture, which are being promoted by a number of NGOs. These include the re-establishment of raised bed systems at altitudes often up to 4000m. These systems traditionally produced bounteous harvests in adverse climatic conditions. Reconstruction of terracing, canal networks and of raised beds requires major initial investment of labour but contributes to significant increases in yields and farmer incomes.

- In Cuba, the Organic Agricultural Association (ACAO) has played a lead role in establishing integrated farming systems in the province of Havana. These systems incorporate a number of key agroecological features, including tree planting, planned crop rotation, polycultures and use of green manures. These have resulted in significantly higher yields and, as the systems have become established, in diminishing labour requirements.

- In the highlands of Bolivia, the use of bonemeal and phosphate rock and intercropping with nitrogen-fixing Lupin species (L. mutablis) have significantly contributed to increases in potato yields.

Altieri's work provides evidence of the tangible benefits of agroecological projects within Latin America, which significantly contribute to increased yields and incomes

for resource-poor farmers and enhance sustainability. Despite the impressive numbers of farmers engaged in formal OAA projects, they represent only a tiny fraction of Latin America's estimated 16 million peasant farming units (Altieri, 2000). In view of this, there is considerable scope to *'promote the right policies and institutional partnerships that can scale up ecologically based agriculture so that its multi functional impacts are spread across the rural landscapes of Latin America'* (ibid. p.630). In the remainder of this section we outline a range organic and agroecological initiatives within a sample of Latin American countries.

Argentina's interest in organic production began in the 1980s and it is now the second largest organic producer (in terms of land mass) in the world. The country has now developed a significant competitive edge over its rivals. It is the only country in the South to have obtained 'Listed Country' status with the EU, which greatly facilitates export procedures, as the certification systems of Listed Countries are regarded as equivalent to EU standards.[35] It is also one of the very few Southern countries to have a certification body (Argencert) with IFOAM accreditation.

There has been significant state support in developing the organic sector in Argentina. The government was one of the first in the South to pass legislation regarding organic standards, and national and regional levels of government provide marketing support for export-led organic production. Recently a number of national and regional agencies came together with MAPO (Moviemiento Argentino para la Produccion Orgánica) to produce a promotional CD, showcasing Argentina's organic sector and potential (MAPO, 2001).

Hager and Balbi (2000) estimate Argentina's organic production to be currently worth $20 million, 85% of which is exported. More than 90% of organic land is dedicated to livestock, mostly beef cattle, but also some sheep and dairy. The organic beef sector in Argentina has grown particularly rapidly. This is partly due to the existence of the fertile grazing lands of the 'pampas', but also attributable to farmers' attitudes. Many of the farmers who have converted to organic production in recent years have longer-standing membership of the Association for the Promotion of Intensive Rotational Grazing (APPRI), set up in 1965 to develop ecological management systems for herds and pastureland. With a long history of resisting the use of synthetic chemicals and the routine use of antibiotics, these farmers were already predisposed to adopting organic management practices (Harriet-Walsh, 1998). Export markets are a key to the success of organic livestock production. The Argentinean beef sector ships up to 2000 kilos of prime beef per week to Belgium, sends an eleven tonne container to Italy every six weeks and 700 kilos of prime beef to Swiss Air on a monthly basis (ibid.).

The main organic crops in Argentina include sunflowers, olives, wheat, soya beans and fruits (ITC, 1999). Argentina is also developing a significant capacity for processing organic food. Pais (1996) identifies some of the lines now being produced in Argentina, often in significant quantities:

- 2 million litres of olive oil per year from three major processors
- daily milk sales of two and a half million litres through 'La Serenisima'
- 150,000 litres of wine produced per annum by Valle Orgánico
- 200 tonnes of wheat used annually in an organic bakery
- Organic honey production in excess of 40 tonnes per annum.

The commercial development of the organic sector in Argentina is perhaps the great success story of the organic sector in the South. Yet there is also much interest in the role of small scale agroecological schemes as a means to promoting the livelihoods of farmers in impoverished and marginalized regions. A system of organic orchards has been established by Pro-Huerta with support from the Ministry of Social Development. This is designed to improve nutritional status of the poorest rural communities and has benefited 2 million people since 1996 (Scialabba, 2000). In Patagonia, which experiences harsh climatic conditions and has seen significant rural exodus over the past decade, the Centre for Investigation and Teaching on Sustainable Agriculture (CIESA) has been involved in developing small bio-intensive plots designed to maximize food yield using minimal external resources. Their experiments in using double dig methods on plots of less than a hectare yield sufficient produce to feed a family of four for six months, and create a cash income of $2-3,000 from vegetable sales. Productivity on these plots increases over time as the organic soil content of the soil increases. CIESA is currently working with the provincial government to extend this work and sustain rural livelihoods (Pia, 2000). Other NGOs active in promoting OAA as a mechanism for rural development include the Environment Action and Study Centre (CEAA) and Eco Ver (Harriet-Walsh, 1998).

Brazil has a tradition in organic agriculture going back to 1973 and today has a large number of co-operatives, smallholders and companies practising organic farming. Most certified produce is destined for export. The main export commodities include fruits, vegetables, wheat, tea, coffee, sugar, nuts, sesame, palm oil and essential oils. There is also a growing internal demand (ITC, 1999). Finding ways of developing and accessing internal markets is particularly important for small-scale producers who are less likely to have the means to engage with the procedures necessary to acquire formal certified status. Despite having a relatively large area of formally certified land and its own certification body (Instituto Biodinamica), Brazil has only recently established provisional regulations defining organic production methods (Fonseca, pers. comm.).[36]

As the largest country in Latin America, Brazil contains a wide variety of ecological, climatic and agricultural conditions and it makes little sense to talk of national priorities or programmes. Significant inter and intra-regional variations in income levels, land holdings and (farmers') access to resources mean that both market and development-led approaches to promoting OAA have relevance. This country profile focuses on a few of many projects currently in place across Brazil.

The Rio Agroecology Network (RAN) was set up in 1998 as a partnership between a number of governmental and non-governmental organizations all working to promote agroecology. Its objectives included: strengthening the role of agriculture in the region, promoting greater sustainability and improving farmers' income, increasing the supply of organic produce, training farmers and technicians in agroecological cultivation systems and consolidating an existing reference centre on agroecology and appropriate technology. The network has two main arms. One is concerned with the social economy, with a focus on participatory diagnostics, market research and dissemination. The second has a more technological focus, developing integrated agroecological systems, participatory field research and validation of technologies, certification and the production of agroecological inputs. After just two years the project has recorded a number of successes. The number of certified organic farmers in the region have increased from twenty to almost one hundred and fifty.

The local university has seen seven theses on agroecology completed, with eighteen more in progress. Food with the regional organic logo is now available in several supermarkets in the city of Rio and there is a growing demand for organic produce within the state. However, the project is a relatively short-term one (in terms of external funding), and has experienced a number of organizational problems largely related to the differing institutional cultures of the organizations concerned and the issues involved in reconciling these (Fonseca et al.., 2000a).

In the north-east of Brazil, a region dominated by large-scale sugar cane plantations, AS-PTA have been involved in promoting the 'Paraiba' project. This aims to promote the sustainable use and conservation of natural resources and increase farmers' incomes. Over a few years they have succeeded in establishing community seed banks for beans and yams, the latter particularly significant as an opportunity for farmers to access an important market for cash crops. The scheme's other priorities include helping install domestic water storage facilities for sixty households and developing and testing new approaches to livestock management and agroforestry techniques. Local confidence and capacity is increasing. As with many NGO projects, it is small-scale in nature and lacks the resources to expand its influence so as to make a significant impact on rural poverty (Sidersky, pers. comm.).

In the southern state of Santa Catarina, the State Extension and Research Service works with farmers. The focus of their work is on soil and water conservation in micro-watersheds, using contour grass barriers, contour ploughing and green manures. Some sixty different crop species, leguminous and non-leguminous, have been experimented with. These are inter-cropped or planted during fallow periods in a wide variety of cropping systems. The experiments have had major impacts on yields, soil quality, levels of biological activity and water-retaining capacity. Yields of maize and soybeans have increased by 66%. Significant labour savings have been achieved through a reduction in the need to plough and weed. Reviews of this work suggest that maintaining soil cover is more important in combating erosion than more intensive methods such as terracing or bunding. More than 38,000 farmers have benefited from these services since 1991 (Guijt cited in Altieri, 2001).

In the hot and dry Ceara region another NGO, ESPLAR, has been involved in a state-wide agroecology development programme promoting a training programme for village leaders. This programme has resulted in adoption of a number of agroecological practices across the state, including:

- Return of arboreal cotton cultivation to mixed cropping systems. Together with integrated control of boll weevil this has enabled restoration of abandoned cotton fields.

- Enriching grazing areas with selected varieties of seed, permitting a 50% increase in stocking rates.

- The introduction of herbaceous legumes for fodder in crop mixtures and rotation systems, and

- The use of small dams to provide irrigation for vegetable production.

(von der Weid, 1994, cited in Altieri, 2001).

Costa Rica has almost 4,000 organic farms and with the exception of Argentina has the highest proportion of land under organic management of any country in Latin America. Bananas are the main crop, although cocoa, coffee, fruits, vegetables, herbs and spices are also important. According to ITC (1999), there is a strong interest in organic agriculture in the country. The University of San José has a research

programme on organic agriculture and several other research projects are being carried out under the auspices of NGOs.

The Costa Rican government has a history of combating environmentally damaging agricultural development.[37] This approach has translated into active support for the organic sector. The Ministry of Agriculture has recently established an organic department and has drafted regulations on organic production, labelling and certification. The organic producers' association has established a national programme and a certification agency. They are working in collaboration with the national coffee institute to develop facilities for processing organic coffee. The Costa Rican Chamber of Commerce promoted an organic trade fair between 1995 and 1997 in collaboration with GTZ, the German development agency (Geier, 1996). The Consortium of Coffee Co-operatives of Guanacaste and Montes del Oro is a coalition of six coffee co-operatives in a remote rainforest area of Cost Rica providing an example of a joint organic/fair trade initiative. It has developed a partnership with Equal Exchange (USA) and exports over 4 million pounds of coffee at guaranteed fair trade prices to North America. The benefits include additional incomes to the farmer and preservation of the surrounding rainforest.

Chubb (2000) writes of a 3000-plus hectare citrus estate, owned by the Commonwealth Development Corporation (a UK government-owned corporation) in the north of the country that recently converted more than 500 hectares to organic production. The estate already contained many fingers of forest (following the lines of watercourses), breaking up the plantations and allowing a free flow of flora and fauna (including natural predators) into the citrus groves. A history of regular application of fertilizer and herbicide had acidified the soil, which required routine applications of limestone. Soil organic content had decreased from 5% to 2% and the lack of ground cover created the potential for soil erosion. Strategies for replenishing the soil included addition of chicken manure (available only in limited quantities) and developing composts using citrus residues from the processing plant. One of the main issues that faces the management is the question of how to re-establish ground cover without creating competition for available nutrients. Locally occurring grasses have been sown in an attempt to provide ground cover and the site is being monitored for the effects on local insect populations. The attempt to convert a perennial monoculture system to organic production is not straightforward and there is a need to exchange information and research findings from similar enterprizes.

The Dominican Republic has been involved in organic agriculture since 1982. It is an important producer of organic coffee, bananas and sugar. Organic banana production first began here in 1989 and now involves 2,500 small farmers (see case study 7, below). A co-operative of 12,000 families has converted half of its sugar production to organic methods. It is estimated that around 20% of the Republic's fruit and vegetable exports are now organically produced and the premia generated are making a major impact in alleviating poverty in rural areas (Holderness et al. 2000).

Involvement in these new markets has led to the development of producer co-operatives, whose work extends beyond agricultural issues and covers rural development in a broader sense. ITC (1999) identifies nine groups involved in producing and/or marketing organic produce, most of whom have a broader rural development role. GRAN has about 1000 farmers spread across 12 villages. It supports organic and biodynamic agriculture and provides credit, technical and marketing assistance and certification services. Conacado is another

producer group promoting organic agriculture, which has a membership of around 2000 small and medium size farmers involved in coffee and cocoa production.

Mexico has a very active organic sector, and is Latin America's biggest supplier of organic coffee. Russell (2000) estimates that there is currently 55,000 hectares of land under organic management and 28,000 registered producers. 98% of organic producers are smallholders, although there are also some large fincas engaged in organic cocoa, sugar and coffee production. Organic production currently generates $70 million per year in export earnings. Joint ventures between US-based importers and small producers are common, especially important in providing specialized inputs such as seeds, packing materials, agronomist advice and certification (Scialabba, 2000). Mexico's proximity to the US and its membership of NAFTA both contribute to its ability to tap into this important export market. The Forest Stewardship Council has its head office in Oaxaca and has a high profile within the country.

The Ministry of Social Development is particularly supportive of organic agriculture and provides assistance to several producer groups. AMEA (Assn. de Agricultores Ecológicos) was founded in 1992 to provide an umbrella organization for the organic movement. It has influenced the Ministry of Agriculture to develop a regulatory framework for organic agriculture. This was established in 1995 and amended in 1997. A national certification body was established at around the same time. However, the Mexican regulatory framework has not achieved equivalence with EU standards, so external inspection agencies are still used for produce destined for European markets. Some European buyers and certifiers have now set up regional offices in Mexico, including Naturland, the world's largest coffee certifier.

The organic sector in Mexico is thought to have a good potential for growth (ITC, 1999). There are extreme disparities of wealth within Mexico and many farmers, especially indigenous peoples, face extreme poverty and a lack of resources. In many instances fair trade schemes which offer access to credit and non-exploitative access to processing and marketing facilities have been seen as more relevant to the problems of the rural poor. In some instances these may be joint fair trade/organic initiatives. The collaboration between Equal Exchange and the Union of Indigenous Communities of the Isthmus Region (UCIRI) is one example. UCIRI were the first group of farmers in Mexico to export coffee under a fair trade label. Since then incomes for the 3000 farmers in 53 villages has doubled, enabling them to establish the first public bus service, the only public secondary school in the area and build a community health clinic. They have also built their own community-owned clothing factory (Equal Exchange, 2000). Other co-operatives, such as Unión de Ejidos Maravillas Tenejapa and Campesinos Ecológicas de la Sierra Madre de Chiapas (both in Chiapas) are struggling to gain entry for their organic produce in export markets (ITC, 1999).

Case study 7 – Organic and ethical banana production

Bananas are the fourth most important food crop in the world in terms of value of production. They are grown both as a staple and an export crop. More than 85% of bananas sold on the world market come from Latin America and the Caribbean, a trade which generates export earnings of more than $4 billion for the region. More than 80% of bananas destined for export come from large plantations using conventional farming methods and relying heavily upon chemical fertilizers and sprays. There are environmental concerns about the effects of intensive farming and deforestation in these areas, which are exceptionally rich in

wildlife and are often described as 'biodiversity hotspots.' There are also social concerns over working conditions within plantations and over the effect of liberalization of global markets in exposing small-scale producers, especially in the Caribbean, to competition from larger scale, more cost-efficient plantations. In response to these concerns a number of different certification schemes are emerging. These include organic, fair trade and 'environmentally friendly' labels, and combinations of these.

The Dominican Republic has been an important innovator in organic production. Its experiences hold valuable lessons for other countries in the Caribbean considering adopting pro-organic policies. In 1999 a workshop on the production and marketing of organic bananas was held to review the experiences of the Dominican Republic and assess their relevance and replicability elsewhere in the Caribbean. A number of technical and social issues were identified:

- Problems of controlling Black Sigatoka, a fungal disease, which affects bananas. The Cavendish variety, one of the most widely grown varieties, is particularly susceptible to this disease, but can be substituted by other more resistant varieties.

- The urgent need to provide training to farmers considering conversion. One recommended avenue for this is the selection of 'leader farmers' as focal points for training and using them to disseminate this knowledge in their communities.

- The use of producer co-ops to overcome certification costs was recommended, as was the development of links between the organic and fair trade movements, to improve market access and premia. Where possible the same certifiers should be used to reduce costs.

The Windward Islands were identified as a particularly favourable area for organic banana production. With a relative absence of Black Sigatoka, they also have an existing banana culture, networks of farmers associations and young farmers who appear interested in pursuing organic production. The removal of 'favoured trading' status with the EU provides an incentive for these islands to seek alternative markets and there is a possibility of linking organic production with eco tourism initiatives.

Elsewhere in Latin America the Rainforest Alliance and Fairtrade Labelling Organization have joined forces to create the 'Better Banana Project' (BBP), the world's largest eco-labelling system for bananas. Criteria for inclusion cover environmental and social considerations. These include:

- Eliminating use of the most harmful pesticides and encouraging overall reduction in pesticide use.

- Implementation of soil conservation, waste management and wildlife protection plans and reforestation programmes, particularly along stream edges.

- Provision of decent wages, safety equipment and training for workers, and of medical care, housing and education for the families.

To date more than 150 farms, across four countries (Ecuador, Panama, Colombia and Costa Rica) have joined the scheme. Between them they cover 74,000 hectares. Dozens more small farms in Honduras and Guatemala have enrolled and are in the process of complying with requirements. BBP production now exceeds 60 million boxes per year, about 10% of the total export production in Latin America and the Caribbean. Some of the largest banana producers have joined the scheme. Chiquita Brands International are committed to

certifying all of their plantations by the end of 2001, and Reybancorp, the second largest banana producer in Ecuador, has also signed up to the scheme. The scheme is not only aimed at large plantations but also includes many co-operatives of smaller producers.

The interplay and competition between these different labelling systems may raise interesting questions, as organic systems compete with 'environmentally friendly' ones, and both attempt to set minimum social criteria for inclusion within their labelling programmes. Consumer and customer recognition of these different brands will prove to be a particularly important test.

(Sources FAO, 2000b & c; Holderness et al. 2000; Scialabba 2000; Wille, 2000.)

4 – Key themes

In this section we explore the main benefits of, and obstacles to, the uptake of OAA in the South. The first four of these themes relate to the natural world, focusing on agricultural and ecological aspects of OAA. First, we examine evidence regarding comparative yields from OAA and conventional systems and discuss alternative approaches to evaluating farm performance. Second, we turn to look at what we believe to be a key defining characteristic of OAA, the promotion and maintenance of agrobiodiversity, that is biodiversity within farming systems. We then turn to examine issues of promoting and maintaining soil fertility and of natural forms of pest and disease control.

The second set of themes relates to the social world and examines the social, economic and political benefits and challenges associated with the adoption of OAA. In the first instance, we look at the issues of trade and market premia, paying particular regard to the question of the orientation of trade (between local and international markets), and the implications that this has for producers wishing to develop the capacity to add value at a local level. We also examine the complex and sometimes contentious issues surrounding certification where there appear to be inherent tensions between maintaining effective and verifiable quality assurance without inhibiting the participation of small producer groups. In the final two sections we revisit some of the questions raised in previous chapters that concern 'macro' and 'micro' influences on the adoption of OAA. These range from the policy orientations of governments to more finely-textured local factors. We pay particular attention to the importance of developing appropriate methods for tapping into existing layers of knowledge where it exists, augmenting it where required and promoting its transfer, where it is incomplete or absent.

4.1 – Productivity and sustainability

OAA differs from conventionally intensive agriculture in that it seeks to achieve optimal sustainable yields rather than maximizing output. Perceptions of the potential of organic farming to meet world food demand have largely been based upon the experience (in the industrialised world) of conversion from one system (and set of aims) to the other. Transitions to organic farming have therefore often resulted in a net loss of yields being recorded, often by as much as 15% (Grolink, 1999). These declines are most marked in the initial years of conversion, when soil fertility needs to be built up and the farmer has to learn new management strategies. They are also more noticeable with some crop types, particularly grain. In the industrialised world, declining yields and the resultant loss of income to the farmer can often be compensated for through a combination of state subsidies (justified on environmental grounds) and premia for organic produce. With the exception of the premia available through export markets, neither of these safety nets is generally available in the South. Thus, a conventional wisdom has emerged that countries with pressing food security problems would be ill advised to contemplate a shift to organic practices and that farmers would suffer if they were to adopt these practices (see Woodward, 1998). FAO identify this as possibly the single biggest factor holding back the development of the organic movement:

'most people in all kinds of areas, including scientists, researchers, extension workers and politicians strongly believe that organic agriculture is not a feasible option to improve food security'. FAO (1998, p.12)

This belief however is largely misplaced, as it is underpinned by the erroneous assumption that farmers in the South will be converting from 'intensive' systems. In what is probably the majority of instances, this is not the case. What then is the effect of switching from non-

intensive, and often under-capitalized farming systems to organic methods? There is as yet insufficient evidence to provide conclusive answers, largely due to the relative infancy of the organic movement and the lack of comparative research in this area (Scialabba, 1998). In general however, it is thought that OAA can bring significant increases in yields in comparison to conventional farming practices. Compared to 'Green Revolution' farming systems, OAA is thought to be neutral in terms of yields, although it brings other benefits, such as reducing the need for external inputs (Grolink, 2000).

In this research we have found many examples where the adoption of OAA has led to significantly increased yields. Table 4.1 (over) provides examples of such evidence. Whilst not a comprehensive review of comparative studies, it does suggest that in many circumstances the adoption of OAA can significantly increase yields, particularly in comparison to unimproved traditional practices. Case study 8 (over), provides a more detailed illustration of two new approaches to rice cultivation which have had significant impacts on yields and disease resistance.

Table 4.1 – Examples of yield increases attributable to adoption of OAA

Altieri (2001) quotes several examples from Latin America where adoption or recreation of OAA has resulted in significantly increased yields for farmers. In Brazil the use of green manures and cover crops in maize/wheat cropping systems has led to increases in yields of between 20-250%. Similar yield increases for maize crops have been achieved in Guatemala and Honduras through the use of soil conservation and green manuring. In Peru, the restoration of traditional Incan terraces has led to increases in the order of 150% in a range of upland crops. In Mexico, Oaxacan co-operatives have seen similar yield increases in their coffee harvest through adaptation of composting, contour planting and terracing.
Edwards (2000) compares figures from composted, chemically fertilized and unimproved (control) plots in Tigray from 1997-8 (see case study 9). In all instances composting led to yield increases of between 3 and 5 times the untreated plots. Yields on the composted plots were generally better than on the chemically fertilized ones. Figures in parenthesis show the range of yields for composted plots in comparison to artificially fertilized ones: Barley (+9 / -0.5%); Wheat (+20 / -0.2%); Maize (+7 / -21%); Tef (+107%); Finger millet (+3%); Kerka'ta (-8%). Due to shortages of compostable material, only half the recommended rate of 16 tonnes / ha. of compost was applied on most plots and the full potential of the organic approach was not realized in these trials.
Hödtke, et al. (undated) experimented in Brazil on intercropping maize with legumes (Vigna unguiculata and Canavalis ensiformis) and ploughing these back in as green manures. They found that grain yield and total nitrogen content of leaves were significantly increased.
Ogol et al. (1999) found that alley cropping systems in Kenya reduced pest numbers in comparison to monocropping and yields were higher despite planting densities in the alley cropping systems being 25% lower.
Rist (2000) reports on AGRUCO's development and extension work with 'de facto' organic farmers in Bolivia, which has increased potato yields by 20% and more.
Sharma (2000) reports yield increases of 175% on farms in Nepal adopting agroecological management strategies (crops not specified).
Soto-Pinto et al. (2000) studied outputs from shade-grown coffee production in Mexico and found that shaded groves had yields 23-38% higher than exposed plots. The role of trees in harbouring predators of pests and diffusing sunlight are thought to be the main contributory factors.
Wai (1995) reports on work at a demonstration farm on reclaimed saline land near Lahore (Pakistan). This incorporated a number of techniques including fish farming, afforestation and a biogas digester for fermenting slurry and manure. Rice yields were 23% greater than under conventional systems and wheat yields 25% higher.

Case study 8 – New developments in rice production

Two recent developments in rice production techniques from different sides of the globe show the importance of innovation and experimentation with new techniques for growing the most important staple crop in the world.

System of Rice Intensification (SRI) Madagascar

SRI was initially discovered by a development aid worker, Father Henri du Laulanie, and has been subsequently developed by an NGO, Associacion Tefy Saina, and two Malagy Universities. Its methods have led to remarkable increases in yields, from the 2-3 tons per hectare common in most parts of Madagascar, to yields of 6, 8, or 10 tons per hectare. This has been achieved on nutrient deficient, acidic soils. SRI uses commonly available germplasm but changes rice cultivation techniques in fundamental ways, described below.

- The first of these was discovered by accident, as a result of attempting to double production from a seed nursery in response to a drought that threatened to shorten the growing season. Rice seedlings were transplanted after 15 days, as opposed to the normal 30. The plants did so well that the technique was repeated again in subsequent years and further experiments were done planting at 12, 10 and 8 days, all producing positive results.

- The second change in practice is planting single seedlings rather than the conventional practice of planting groups of three or four, which is designed to ensure survival of at least one or two plants. More care has to be taken with single planting, but if done properly it encourages stronger and more vigorous plants, through reducing intra-species competition.

- The third change is that of spacing plants more widely apart, at densities of 15-20 per square metre as opposed to the 50-100 common in other systems. This provides individual plants with a larger area from which to draw nutrients and the opportunity to develop a more robust root system.

- The fourth change is that of periodic drying of fields. From observation and discussions with local farmers, Father Laulanie began experimenting with periodic drying of fields so that they were not continually submerged. It is thought that this changed practice contributes to plant development through increasing aeration and subjecting the plant to periodic (but not excessive) stress, which encourages growth.

- This system involves more regular weeding than flooded paddy systems, which suppress weed growth. Experiments have shown that greater frequency of weeding also helps plant development due to greater aeration of the roots of the plant.

- Finally, SRI is practised using manures and composts. Initially chemical fertilizers were used, but as prices rose in the 1980s experiments with compost were undertaken. It has not yet been established whether compost and natural fertilizers are more or less effective in this system than artificial inputs.

IRS has evolved over almost twenty years in Madagascar and been used in many different ecological and climatic conditions. Farmers using SRI on the borders of a national park (with particularly poor soils) have recorded yields 50-60% higher than those on demonstration farms in fertile areas managed by private companies experimenting with input intensive systems and hybrid seeds. Labour inputs for SRI are significantly higher than under conventional systems, but are

more than rewarded. Farms with labour shortages find that it is more profitable to cultivate part of their land under SRI rather than the whole farm under conventional management techniques. While spectacular, the successes of SRI have not yet been fully explained. Uphoff provides rationales for some of the success of this approach, though others require further research and explanation. Regular weeding and aeration appear to be strongly correlated with yields, but the synergies between the different elements of the management techniques are not yet fully understood. More critically, SRI has not yet been experimented with, nor the results replicated, outside Madagascar. Agronomists have arguably been wary of taking up research that challenges orthodox practice. The rice research community is now beginning to respond to these challenges by attempting to replicate and explain these successes. The evolution of these systems illustrates the potential of farmer / NGO-led experimentation to evolve new farming approaches with potentially wider applicability.

(Source: Uphoff, 1999; Pretty and Hine, 2001b)

Intercropping as a strategy against disease

The second innovation is a system of inter-cropping developed by Prof. Chris Mundt (Oregon State University) and the International Rice Research Institute. Farmers in Yunnan Province (China), were persuaded to interplant their traditional sticky rice crop, prone to the fungal disease rice blast, with a disease resistant hybrid. The two varieties were planted in alternating blocks and the hybrid seeds acted as firewall against the disease. In the first year of the experiment rice blast was reduced by 94% and yields were up by 89%. Neighbouring townships joined the experiment the following year and by the end of this period, 60,000 ha of rice were being grown by this method. Fungicides (previously applied eight times a season) were no longer required and it was found that the larger the experimental area, the more effective the technique became. Gross income per hectare increased by 15%, not including savings on fungicides, and there was a reduction of fungicide runoff into local water-courses. Though not necessarily an organic production system, the experiment demonstrates the benefits of the application of one of the principles of OAA – the promotion of diversity.

(Source: Stott, 2000)

Indicators used to evaluate conventional agriculture often give primacy to single crop yields as the main criterion of efficiency. Yet such measures are often inappropriate for both organic and traditional forms of farming. As noted earlier, traditional farmers are often more concerned with avoiding risk rather than maximizing output. Farmers often sow different varieties of the same crop to insure against the risk of drought or disease. They do so knowing that their yields will be lower, but that they are minimizing exposure to the calamity of losing a whole harvest. Equally, farmers may well choose lower-yielding grain varieties if they have other desirable characteristics. For example, in India many farmers choose varieties of rice that produce good quality fodder for livestock and an acceptable grain yield (Shiva, 1995, p.85).

Single crop yields are not the only criteria by which agricultural productivity should be judged. Other 'output based' approaches such as net farm productivity, return to capital, land or labour, are also important indicators of farm productivity. These measures are likely to be more relevant to small-scale farmers growing a range of crops, often from limited resources. One study in South India compared seven paired farms (one ecological and one conventional) with similar agroecological characteristics and market orientations. It found no significant economic differences between the two sets of farms, with gross income and margins, variable costs, net cash income, days of labour per

land unit and returns to labour all within a similar range. The two sets of farms did, however, vary in a number of other respects. Ecological farmers cultivated a broader range of crops with more mixed intercropping, systems using a wider range of species and more varieties of the same species. The ecological farmers were less dependent upon external sources of nutrients and used a wider range of techniques to maintain soil fertility on a larger and more efficient scale. There were no significant differences between yields on the two sets of farms, with the exception of rice yields, which were higher on the ecological farms (der Werf 1993).

Whilst comparative evaluations of farm productivity are important in assessing returns to farmers in the short to medium term, broader and longer term measures of sustainability also need to be considered. Of particular interest are those which take into account the *'environmental services obtained from complex, integrated agroecological systems featuring many crop varieties together with trees and animals'* (Altieri, 2001, p.1). Conventional measures of farm outputs and returns tend to neglect these non-monetized aspects of farm productivity, although they are critical in maintaining productive capacity. New measures are being developed which take such features into account. A partnership project between IFOAM, LEISA and FAO is developing a universal methodology for comparing farm performance against parameters of sustainability.[38] The factors considered in this model include: capital assets; renewable energy use; energy, water and nutrient balances; organic vs. chemical nutrients; organic matter applied; market dependence; external input dependence; area under trees; number of species; and degree of mixed cropping (Witte 1999). In addition, wider impacts of the farm and farming system are considered, including: agricultural biodiversity; environmental impacts; financial performance (productivity of land, labour and capital); and social aspects (e.g. equity, community participation, food self-sufficiency) (ibid.).

The aim of this approach is not to provide a 'single index'-based comparison between different farming systems (which would inevitably involve value judgements about the weighting given to different measures), but to be able to compare how different farming systems perform according to these criteria. Use of the FARMS programme (Chinnakonda, 1997) enables intra and inter-regional comparisons to be made against baseline sustainability criteria

Studies employing this methodology are currently being carried out with partner organizations in ten countries across the South: in Africa (Ethiopia and Kenya); Asia (China, India, Nepal, The Philippines, Sri Lanka) and Latin America (Costa Rica, El Salvador and Nicaragua). Some initial results from the first phases of these comparative surveys were presented at IFOAM 2000. Chinnakonda and Lanting (2000) describe some of the initial findings. They identify some general criteria of sustainability where organic farms perform better than conventional ones. These include energy use, nutrient sources, mixed cropping and the generation of livestock feed. In low-rainfall areas, the use of organic matter is a crucial determinant of sustainability, as it plays a central role in helping reduce loss of soil moisture. In humid zones with high levels of tree cover, both organic and conventional farms exhibit high levels of biodiversity. Organic and conventional farmers within the same areas also exhibit similar levels of dependency on external inputs and markets, suggesting that prevailing market systems influence these parameters more than the farming methods adopted. Interestingly, the study also found a lower participation rate of women and succeeding generations within organic farms, leading the authors to question the sustainability of organic farms as enterprizes.

These findings are preliminary and based upon a limited number of case studies where sufficient data has been gathered and processed. This research programme, still in its early stages, has the potential for providing a 'system' rather than output-oriented analysis of the performance of agricultural approaches.[39] In time, it may provide a more informed basis for evaluating the contested benefits and drawbacks of organic and conventional farming systems in a range of agroecological contexts. Some of the differences in the parameters may only become visible in the longer term. Indicators such as soil fertility and biodiversity can only really be assessed over the medium to long term. Others, such as yields and returns also require a longer-term perspective and need to be averaged over a number of years, as they are influenced by exogenous factors such as climate and, in the later instance, market conditions.

4.2 – Organic agriculture and diversity

The maintenance and promotion of diversity is arguably the single key defining characteristic of OAA. According to Altieri (1999) there are a number of reasons why diversity is important within individual agroecosystems.

'Research suggests that the level of internal regulations of function in agroecosystems is largely dependent on the level of plant and animal diversity present. In agroecosystems, biodiversity performs a variety of ecological services beyond the production of food, including the recycling of nutrients, regulation of microclimate and local hydrological processes, suppression of undesirable organisms and detoxification of noxious chemicals.' (p.19)

The emphasis that proponents of OAA lay upon maintaining and enhancing diversity is in stark contrast with the monocultural approach favoured by industrial models of agriculture. It has much more in common with traditional farming systems which employ strategies which *'have more to do with minimizing the risk of failure rather than maximizing yield per se'* (Kinnon and Bayo, 1989 p.58). Two specific forms of 'risk reduction strategy' employed by traditional farmers across the world are set out in Table 4.2 (over). Each has a compelling logic for traditional farmers and emphasizes the importance of maintaining sustained yields in preference to maximizing outputs.

Different levels of sophistication may exist in the employment of both phased and mixed cropping regimes. In some cases, simple combinations of two or three crops may be used to spread risk, maintain soil cover, suppress weeds, increase soil fertility and/or deter pests. An illustration of how agrobiodiversity at this simple level helps maintain ecosystem stability is shown in Table 4.3, which compares annual rates of topsoil loss in Nigeria under a monoculture

Table 4.2 – Risk-reduction strategies of traditional farmers

Mixed planting:	**Phased planting**
Ensures a continuing and varied supply of food throughout the year.	Minimizes risks, especially from climatic uncertainties.
Increases overall production units per area.	Provides phased harvests.
Helps reduce incidences of pests and diseases.	Evens out labour demand over the year.
Enables planting to take account of soil variations.	Reduces land preparation costs
Provides soil cover against erosion.	Provides ground cover.
Assists with weed control and reduces labour inputs.	

Adopted from Kinnon and Bayo, (1989)

Table 4.3 – Annual soil loss (tons/hectare) at Ibadan, Nigeria

Slope (%)	Cassava only	Cassava and maize	Difference
1	3	3	0%
5	87	50	43%
10	125	86	32%
15	221	137	38%

Aina et al. (cited in Kinnon et Bayo, 1989).

of cassava and under a joint cassava/maize regime. On slopes of 5% or more the inter-cropping system resulted in soil loss rates between 30-40% less than the monoculture, as the former provides more effective and continuous ground cover. Thus inter-cropping has an important role to play in helping safeguard the existence of the primary natural resource upon which agriculture depends – the topsoil.

Intercropping can also have major benefits for weed control, a major problem in most agricultural systems. In some places the laborious work of hand-weeding can account for more than 80% of labour demand in traditional low input farming systems (Abbiw, 1989). In other areas the labour required for weed control constrains the amount of land that families choose to farm. Use of cover crops or 'live mulches' can significantly reduce the burden of weeding, freeing up time for other, more productive activities. Blench (1997) identifies a number of leguminous species which are being used to improve fallows and control weeds. Species used include the velvet bean (*Mucuna* spp.), jack bean *(Canavalia ensiformis)*, tropical kudzu *(Pueraria phaseoloides)*, and perennial peanuts *(Arachis pintoi)*. The practice of using velvet bean is to control imperata grass (*Imperata* spp.), which is spreading throughout Togo, Benin and Columbia. Velvet and jack beans are being used in Panama to control paja blanca (*Saccharum* spp) and nutgrass in several other countries. In Nepal, gandhejhar is left in fields until ploughing starts. It stabilizes the topsoil and reduces runoff, suppresses other weeds, is used as fodder or bedding for animals and then returned to the land as compost (Pandeya, 1995).

Studies by the International Institute of Tropical Agriculture have found that basic cereals (such as maize and cassava) intercropped with *'Egusi'* melon *(Cucumerospis mannii)* need weeding only once every two to three weeks instead of weekly. The ground cover provided by the *'Egusi'* suppresses weed growth until the melons are harvested, by which time the cereals have established themselves and developed their own canopies (Akobundu, 1993). Other experiments have shown mulching to reduce weed biomass by up to 90% (Thijssen 1995). Mulching can also contribute to changes in the composition of weeds. In an inter-cropping system (involving Gliricidia, Leucaena and Cassia species) in Kenya, weed composition changed from grasses to broad-leaved weeds, which are far easier to control *(ibid.)*.

The effectiveness and choice of intercropping systems depends upon many factors. Blench (1997) argues that the multi-functionality of these crops are important factors in determining their attractiveness to farmers. Many of these crops, such as the 'Egusi' melon, the high altitude scarlet runner bean *(Phaseolus coccineus)* and the widely used velvet bean (*Mucuna* spp.), also produce food for human consumption. Others provide animal feed. In Campeche (Mexico), the seed of the velvet bean is cooked, ground

and mixed with maize to provide pig fodder, and while most leguminous mulches do not graze well, they can be cut and used for fodder after even months of drought (*ibid*. and Abbiw, 1989).

At a more complex level, experiments conducted by the International Centre for Insect Physiology and Ecology (see section 3.1) illustrate how mixed cropping and the use of 'host' and 'trap' crops can contribute to pest control, suppress weeds and provide valuable additional forage for cattle. More sophisticated practices such as 'alley cropping', involve planting parallel lines of legumes, staple crops and bushes, together with nitrogen fixing and/or fruit bearing trees. Such systems are widely employed in different parts of the world, with alley cropping methods recorded in Brazil (Bertalot et al.., 2000), Cameroon (Adesina et al., 2000), Kenya (Ogol et al., 1999), Nigeria (Cashman, 1987) and Sri Lanka (Sangakkara and Ratnayake, 1989). Kho (2000) suggests that alley intercropping would be viable in around 15% of land in the tropics. He suggests that such systems have significant benefits for nitrogen retention/accumulation, but not for other nutrients. Alley cropping can have some drawbacks in that trees may compete with crops for scarce water supplies.

Trees can play a key role in helping maintain the diversity and productivity of farms. As Edwards (2000, p.8) notes:

'In windy areas the windbreak effect of trees can significantly reduce the loss of water through evapotranspiration. Trees also maintain and restore soil fertility and control erosion. Their leaves can be used as fodder as well as for composting. They provide soil cover when the pruned branches and leaves are left on the soil. These increase soil nutrients, suppress weeds and improve soil structure. Tree roots help bind the soil together and promote the infiltration of water. The deep rooting systems of trees help recycle nutrients by returning leached cations to the soil as leaf litter. The ability of certain species to survive the dry season and maintain their green leaves means that there will be active roots in the soil when there is a flush of mineralized nitrogen at the start of the rains. The roots act as a safety net capturing the nitrogen that would otherwise be leached away.'

Trees also serve other functions, providing the farm with fuel and construction materials, attracting birds and wildlife and 'providing shade for livestock and people' (Kenyan farmer, quoted in Collis, 2000). In Kenya the International Research Centre into Agroforestry is doing research and extension work on the use of leguminous tree fallows which recycle 100-150 kg nitrogen per tree p.a.. They have also introduced species from Mexico, which provide animal fodder at low cost, increasing milk and manure yields (see section 3.1). In the area around Debre Zeit (Shoa Province, Ethiopia), self-seeded Acacia Albida trees are maintained by peasant farmers who recognize their capacity to enrich and stabilize the soil and provide fodder (Harrison, 1987). Research from Senegal (see table 4.4), shows the beneficial effect of this species on millet protein yields. Islam and Weil (2000) found that reafforestation with acacia species in Bangladesh significantly improved soil quality. However a similar study in Costa Rica found agroforestry systems had not significantly improved soils compared to adjacent pastureland (Tournquist, 1999). This suggests that agroforestry is not a universal panacea. In general however, intercropping of trees and annual crops produces a number of beneficial synergies, illustrated in Figure 4.1 which shows the influence of trees on the growing environment of maize in Tlaxacal, Mexico.

Despite the known beneficial effects of trees in the farm environment, tree cover in arid

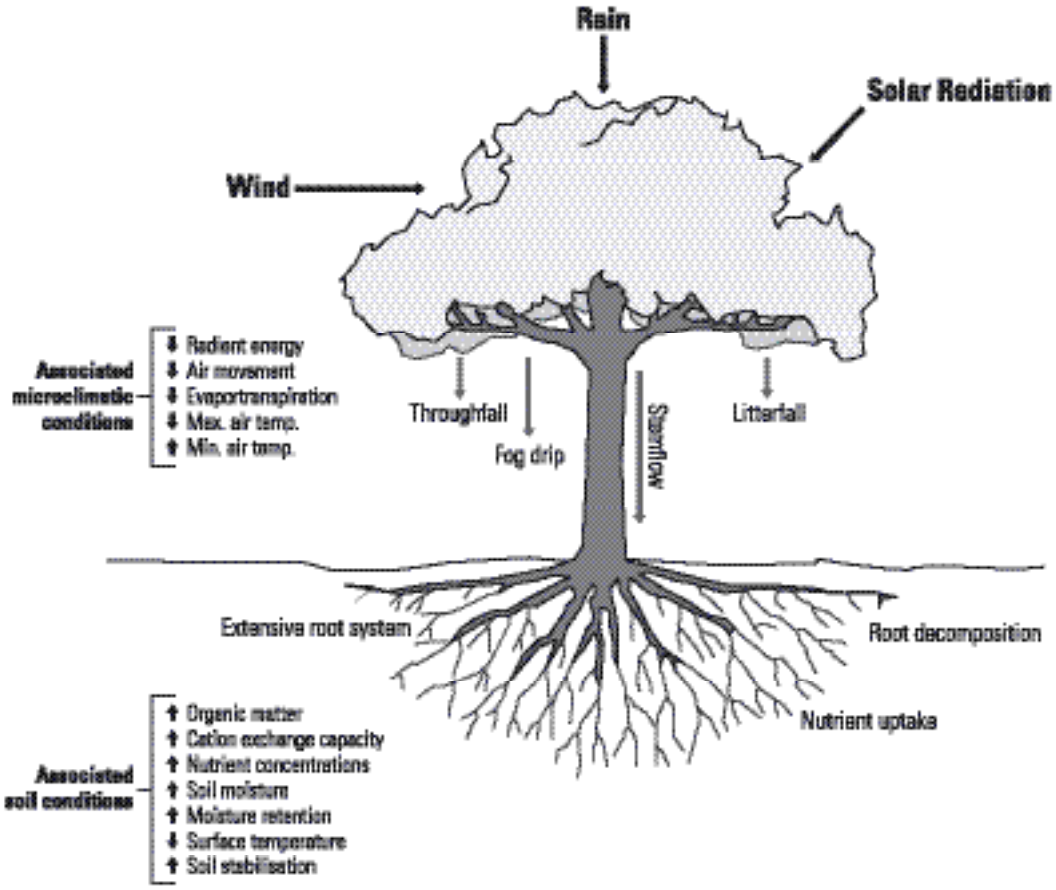
Table 4.4 – Effects of A. Albida on millet yield in Senegal

	Near tree trunk	Edge of tree canopy	Outside tree canopy
Millet protein yield (kg/ha)	180	84	52

from Charreau and Vidal (cited in Kinnon et Bayo, 1989)

zones is being lost at an alarming rate. Climate change, pressure from overgrazing and the over-riding need for fuel are all contributory factors. Once lost, tree cover is usually difficult to re-establish. Moreover, the division of administrative responsibilities between farming on the one hand and forestry on the other, means that there is rarely much governmental support for dispersed tree planting programmes. Some NGOs, such as the Green Belt Movement in Kenya (Maathai, 1986) have a specific focus on encouraging tree planting on a community basis. Other institutes, such as the International Centre for Research into Agroforestry (Collis, 2000) and the Henry Doubleday Research Association (Harris et al., 1989) undertake research and extension work on the tolerance and effectiveness of different species of tree. Badejo (1998) identifies more thirty species of trees endemic to savannah ecosystems, which play a major

Figure 4.1 – Influence of trees on maize cropping in Tlaxacal (Mexico)



(from Farrell, 1984, reprinted in Farrell, 1987)

role in increasing fodder available to livestock, provide coppicing materials and in many instances have nitrogen-fixing capacity.

One piece of research from South India, comparing seven pairs of 'conventional' and 'ecological' farms found that the greatest difference in the agronomic characteristics of the farms was the density of tree cover. Ecological farms had an average tree density of almost 200 per hectare, but conventional ones less than 40 per hectare (der Werf, 1993). This suggests that organic farmers more fully appreciate the multi-functional benefits of trees than their conventional counterparts. Our impression is that there is insufficient research in this area, that extension services are lacking and that both activities are poorly integrated with agricultural development programmes.

Agroforestry provides an example of the most diverse and complex type of agroecosystem. Agroforestry systems consciously mimic the multi-storeyed patterns of surrounding forests. They have nearly closed cycles of biomass and nutrient production, provide year-round supplies of food, and permanent ground cover (Harrison, 1987). Crops are grown at different heights, with the tree canopy managed so as to provide both shaded and sunny areas. The density of vegetation assists with microclimatic regulation in terms of temperature, humidity and rainfall absorption. The case study of the Chagga Home Gardens provides but one example of the complexity and diversity of agroforestry systems. Hampl (2000, p.427) describes the complexity of a typical agroforestry spice field in Zanzibar:

'The highest layer of 20m height is composed of coconut trees and various fruit trees such as malayan apples (Eugania jambos), mango fruit (Mangifera indica), jackfruit (Artocarpus heterophylla) etc. The succeeding layer of clove trees is about 12-15m high; below that grow papayas (Carica papaya), banana trees and often Glyricidia sepa with pepper. Pepper as a climbing plant particularly suits to be integrated into agroforestry systems (sic); it climbs on fruit trees most of the time. This way the farmer makes double the profit from one area (fruits and spices) and takes no economic risk in case of bad pepper prices. The bottom layer is planted with low growing species, in terms of spices, cardamom (which prospers in woody structures), ginger or turmeric; in terms of fruit pineapple or starchy plants like colocasie (Colacasia esculenta) and cassava (Manihot esculenta).'

General overviews of the extent and range of agroforestry across the world can be found in Farrell (1987) and Egger (2000). While there is a long history of research in this area (see for example; Ruthenberg, 1971), it was until recently thought that *'these systems (while) of great historic interest, could not provide any advice for actual agricultural development'* (Egger, op. cit.). The International Centre for Research in Agroforestry (ICRAF) in Nairobi exists to promote and disseminate information and research in this field.

Agroforestry systems tend to be more closely aligned with agroecological than organic production, although several 'agroforestry systems' are organically certified, including the Chagga (for their coffee) and the Meru (for dried herbs). 'Shade-grown' coffee and cocoa, even if not certified as organic, also generate premia from environmentally-minded consumers in the North and contribute to maintaining biodiversity (Johns, 1999). Soto-Pinto et al. (2000) identify several benefits of shade-grown coffee production systems in Mexico, which help reduce pest problems and, through filtering excessive sunlight, contribute to yield increases. They calculate optimal shade cover as being between 23 and 48% with yields declining at higher shade densities, although this figure probably varies according to heat/sunlight intensities in different climatic zones.

Although agroforestry systems normally result from human management of existing forests, there are several examples of such systems being established from cleared land. In Burma in the 1930s, the landless poor were encouraged to plant food crops for a period of four years on cleared forest land. No rent was charged for the use of the plot, instead the farmers were obliged to plant and protect young trees for this period, thus enabling regeneration of the forests. In Brazil, recent experimental work using agroforestry techniques has led to the rehabilitation of cleared land into productive and diverse usage, without the use of external inputs (Peneireiro et al.., 2000).

Agroforestry systems generally exhibit a great range of species diversity. For example, the Chagga cultivate 39 species of woody trees and shrubs, and 15 varieties of bananas in their home gardens (Fernandes, undated). In West Java, researchers have identified more than 230 species of plant within a dual cropping system, which includes 'agroforestry' home gardens and outfields (Christanty et al., 1986 cited in Blench, 1998). In Mexico, the Huastec Indians manage a number of plots (home gardens, forest plots, and agricultural and fallow fields) in which up to 300 species are cultivated. Areas around the house may contain between 80-125 useful species, many with medicinal properties (Alcorn, 1984, cited in Altieri, 2001). Local knowledge of the properties and characteristics of such a diverse range of species represents a significant repository of knowledge, often orally maintained, which has potential global significance. In this respect the discipline of ethnobotany has much to contribute to the promotion and dissemination of knowledge regarding OAA.

The diversity of species maintained within traditional farming systems is in stark contrast to the dominant pattern of intensive agricultural practice, in which '15 varieties of plant species worldwide provide 90 per cent of the calories used to feed the world' (Soule et al., 1990, cited in Kirschenman, 1998). In this respect, it might be argued that poor peasant farmers do more to maintain global biodiversity and the resilience of the gene pool than publicly and privately funded institutions put together. They do so out self-interest. The use of what Blench (1998) terms 'minority and neglected species' is a necessary survival strategy for many farmers, especially those maintaining a livelihood in harsh, marginal environments.

'(Minority) species are strongly associated with marginal environments; regions where extreme heat, poor soils and access problems make the large scale production of world crops and livestock uneconomic. These (species) play a disproportionately large role in food security strategies. Plants that will grow in infertile or degraded soils, and livestock that will eat degraded vegetation, are often critical to household nutritional strategies.' (ibid.)

Recent years have seen a growing interest amongst Southern-based NGOs in developing and maintaining seed exchange networks. In so doing they are formalizing a strategy that resource poor farmers have practised for millennia. In Peru for example, indigenous farmers cultivate more than three thousand varieties of potato. More than five thousand varieties of sweet potato are cultivated in Papua New Guinea (Shiva, 2001). In southeast Ethiopia, the Konso cultivate 49 species of plant, shrub and tree, and 24 different species have been counted within one 0.2 hectare field (Harrison, 1987). Such diversity has only been achieved through constant exchange, development and experimentation with seed varieties, where peasant farmers select and adapt the most suitable varieties to grow under a range of conditions. Today more formalized, better-documented, approaches to seed exchange are being developed.

Several of the NGOs responding to our survey see their work in developing seed exchange networks as a key activity, crucial to maintaining the productive resource base available to farmers (see, for example, case study 6 on the World Food Day Farmers' and Fishermen's Movement in Indonesia). In many cases, seed exchanges are organized through 'market days', where farmers can bring seeds and swap experiences (Shiva, 1995; Intermediate Technology Research Group, 1999). In other cases there is an emphasis on building national databases from existing, but often orally maintained, local and regional knowledge. For example, in India, Navdanya have established a Community Agricultural Biodiversity Register. This has been developed to facilitate exchange of information, protect endangered plant varieties and most importantly, establish intellectual property ownership rights for the Indian peasantry (Shiva, op. cit. p.78).[40] Shortly after its establishment it had already recorded 250 varieties of rice in use by peasant farmers across India, as well as dozens of varieties of other grains and pulses.

Whilst the use of traditional seeds and varieties has a very important role within OAA, this does not mean that there is no role for the development of new species. Indeed there is a potential for developing synergies between traditional and scientific approaches. A new coffee variety, *Ruiri 11*, which is pest-resistant and does not require any chemical spraying, has been developed by the Coffee Research Foundation. After some initial scepticism this variety has now been adopted with considerable success by one in three Kenyan smallholders (Gathimbu, 2000). Successes such as this appear relatively isolated however, with Southern NGOs increasingly vigilant to the threat of 'biopiracy' (Shiva, 1985)

The importance of species diversity as a strategy within organic, agroecological and traditional farming does not just apply to plants, but also to livestock. Animals play a crucial role in the strategies of many peasant farmers, converting otherwise inedible vegetable matter to protein, providing much-needed manure and also often acting as beasts of burden. Their role in recycling nutrients and maintaining soil fertility is particularly important and is considered below.

As with crops, the conventional focus upon high-yielding animal species, which also often require high inputs, has led to the neglect of 'minority species' which are often more adapted to local habitats and agroecological circumstances (Blench, 1998). The FAO has documented 5,000 domesticated livestock and poultry breeds, of which one third are in danger of extinction. It is believed that these indigenous species are currently disappearing at a rate of one a week (Anon, 2001). In many instances such species play a central role in maintaining the economic well-being and cultural identity of marginal farming or pastoralist communities (see for example Köhler-Rollefson; Rathore; Yakshi et al.., all 2001). Locally preferred species, which require low inputs and are adapted to specific socio-ecological niches are often neglected from research programmes (Blench, 1998).[41] Such programmes often focus upon issues such as how to introduce and adapt species that have proven successful under high input systems in the industrialised world (ibid.). In so doing they ignore both the multifunctional role of animals within the domestic economy and the inappropriateness of promoting high input/high output into low input economies.

In India, attempts are being made to preserve and reintroduce indigenous species and to improve and develop relevant (and low cost) animal husbandry techniques (Daniel, 1989; Harbola and Kumar, 2000; Köhler-Rollefson; Yakshi et al. and Rathore, all 2001). A recent international workshop, held in Rajasthan and involving NGOs, herders, scientists and others, discussed the relevance of local

livestock breeds for sustainable rural development. This workshop led to the issuing of the 'SADRI Declaration', which acknowledges the importance of indigenous breeds for rural development in India and recommends a series of measures designed to enhance the survival and well-being of these species and the peoples who depend upon them (Anon 2001a). Elsewhere the importance of ethnoveterinary medicine is beginning to receive scientific recognition (Mathias, 2001a). An annotated bibliography of ethnoveterinary medicine is due to be published by the Intermediate Technology Group in London.[42]

Two other complementary and synergistic production systems are also worthy of mention – those of aquaculture and apiculture. Both have long established traditions in many different parts of the globe. Bergleiter and Stiedle (2000) explore the potential of organic aquaculture systems and Stoll (2000, p.96) notes that rice/fish inter-cropping is particularly effective in protecting rice against stemborer and planthoppers, and also reduces numbers of leafhoppers and leaffolders. Fish also help reduce the prevalence of a number of rice diseases and viruses such as sheath blight, bacterial leaf blight and rice stripe. Published evaluations of sustainable rice/fish culture systems exist for Thailand (Mackay et al.., 1986) and Bangladesh (Thrupp, 1996). In Ecuador an organic shrimp farming enterprise has recently been established (Bergleiter, 2001), an innovation which is attracting interest from other parts of the world, not least because of the often catastrophic consequences of conventional shrimp harvesting on mangrove eco-systems. Apiculture (bee-keeping) also plays a significant role in farm ecosystems, particularly via the important role of bees in helping pollination (Weiler, 2001).

In recognition of the vital role of biodiversity and its preservation, the Italian based Slow Food movement recently established a prize to honour and reward individuals actively involved in this field (Scaffadi, 2001). Of those nominated for the first annual prize in 2000, half are involved in promoting traditional knowledge systems of agriculture and/or methods of production in the South. In 2000, nominated projects of this kind included:

- A company pasteurizing and selling milk from nomadic herdsmen in Mauritania
- two biologists working in Mexico to preserve an indigenous species of fish and the ecosystem on which it depends
- the promotion of traditional vanilla cultivation in Mexico
- maintenance of an endangered bee species in Turkey, which produces a unique form of honey.

4.3 – Natural methods of enhancing soil fertility

Maintenance of soil fertility under organic and agroecological approaches is a particularly complex topic, involving a wide range of variables. Natural variations in soil types, climate, mineralization rates and cropping systems all affect levels of soil fertility and trends of nutrient depletion or accumulation. The availability of local resources (both on and off-farm) for building and maintaining fertility helps determine the range of viable strategies for the maintenance and improvement of soil fertility. Social factors influence the social appropriateness and acceptability of different soil fertility management techniques. These will include: the intensity of existing farming practice; structure of farm holdings (including tenure and the availability and division of labour); levels of local knowledge and social co-operation; and the existence, or otherwise, of technical support. Unlike conventional agriculture with its 'one size fits all approach', there are no single recipes for success and

'extensive experimentation work and creativity are required' (FAO, 1998, p.10).

Traditionally in many areas, especially in more arid zones, soil fertility has been maintained by extended fallow periods, often in association with slash and burn techniques. However, with growing population pressures these fallow periods are in many cases becoming shorter (or non-existent) and more proactive strategies for managing soil fertility are required. These may draw on traditional practices and local materials, rely on industrial inputs, or a mixture of the two. Hilhorst and Muchena (2000) identify a number of different soil nutrient management practices available to farmers (see Table 4.5, over). Although this range of practices was identified as part of a study of nutrient dynamics in Africa, it does seem to reasonably comprehensively cover the range of options open to farmers.[42] [43] We use it here as a basis for discussion of some of the issues and constraints involved in using natural techniques as the basis for managing soil fertility.

The effectiveness and popularity of the techniques described below will vary according to natural and social constraints and opportunities. In hilly areas, and/or those with heavy periodic rainfall, construction of bunds and terraces may well be the most important mechanism for preventing erosion and maintaining the presence of topsoil. However, the willingness of farmers to invest in these labour-intensive solutions is likely to depend on a number of factors – especially their security of tenure, for there is little point in investing heavily in land improvements if there is insecurity over land rights. Such a lack of security can also be a disincentive for other labour intensive approaches, such as tree planting or double dug beds.

The availability of livestock can play a key role in determining soil fertility management strategies available to farmers. Livestock play a key role in transforming otherwise inedible grasses and crop residues into manure (and protein). This role is especially important when animals are grazing marginal or otherwise unproductive land. Mixed farming patterns incorporating livestock and cropping are commonplace across the globe (but rare in humid tropical zones, owing to the prevalence of tryponosomiasis) and might be regarded as forming the basis of sustainable organic farming practice. In some areas, such as Java, farmers attach as much importance to the manure produced by livestock as to the protein. Their strategies for managing livestock are geared towards maximizing manure production; essential to *'maintaining one of the world's most intensive smallholder farming systems'* (Tanner et al. 2000). The management of animal waste and its use in promoting soil fertility is a key topic in its own right (see, for example, Lekasi et al.. 1998, for a discussion of strategies amongst upland farmers in Kenya). The issue of maintaining soil fertility in areas that cannot support large ruminants is more problematic.

The inclusion of artificial fertilizers in Table 4.5 (above) is useful, in that it highlights some of the advantages and disadvantages implicit in their use, and by extension some of the constraints and incentives to converting to OAA. This is an important issue to consider in seeking to understand how farmers evaluate between the range of options open to them. For farmers, more concerned with obtaining a decent harvest than with ecological purism, artificial fertilizers are another potential tool available to support their struggle to make a living from their land. Cost and limited availability may often be constraints on their use, but there are other disadvantages too: they need annual applications, can get washed away in heavy rains, potentially damage crops in dry periods and contribute to a hardening of the soil. However, their consistency and the ease of transporting and applying them can make them an attractive option in some situations,

Table 4.5 – Nutrient management strategies

Nutrient management strategies	Advantages and relevance	Disadvantages and constraints
1. Adding nutrients		
1.1 Fallowing	Traditional method often associated with cut and burn.	Population pressure leaves less land available to fallow (or for less time). In response, farmers have sometimes moved to less productive soils and accelerated soil degradation. Cut and burn is now discouraged by many governments.
1.2. Use of mineral fertilizers	Encouraged by many governments, often through subsidy or state organized distribution systems. Easy to transport, apply and of consistent quality.	Need to be purchased in advance. Price increases have restricted use in many places: often they are used only on cash crops, where the outlay will be recouped. They require annual application. Farmers may be aware of some negative effects on soil quality, especially in dry areas where they may harm (burn) crops.
1.3. Use of rock phosphates	Helps recapitalize soils through a one-off application. Currently being promoted in Africa under a number of different schemes. An indigenous resource to several developing countries.	Works best in combination with other fertility techniques (chemical or organic). Distribution systems have proved inadequate. Use of phosphate not fully understood by farmers.
1.4. Inflows of nutrients from grazing	Important and traditional technique of maintaining soil fertility which efficiently utilizes local resources.	More available to wealthier farm households who own (more) cattle. Livestock less common in humid areas due to problems of disease.
1.5. Cultivation of nitrogen-fixing crops	Mixed cropping incorporating legumes has a long tradition. Use of nitrogen-fixing trees and leguminous species within or on the edge of fields is being pursued in some areas, often with considerable success.	As pressure on land increases, legumes are given lower priority in cropping system.
2. Minimizing nutrient loss	**Advantages and relevance**	**Disadvantages and constraints**
2.1 Controlling erosion, run offand leaching	There is a long tradition of preventing soil erosion through building bunds and terraces. In many areas interest is being revitalized as soil erosion and nutrient loss become more pressing concerns.	Historically such approaches have often been top down and not been adequately maintained in 'post project' phases. They are labour intensive processes and mobilizing resources can be problematic.
2.2 Trees in fields	A traditional approach that can help stabilize soils, fix nutrients, create fertile niches in fields and provide timber, fodder and shelter.	Only practised in some areas. In other areas extension workers have encouraged tree clearance.

2.3 Double dug beds	Double digging aerates the soil, improves water absorption and retention, promotes stronger root growth and encourages more ready uptake of nutrients.	Very labour intensive and only generally used on high value cash crops.
3. Managing internal flows		
3.1 Use of manure, slurry & urine	See 1.4. above. Techniques for managing animal wastes vary considerably according to intensity of system and assets of individual farmers. Applications do not need to be made annually.	See 1.4 above.
3.2. Recycling and composting organic materials	Widely used and on the increase, particularly amongst farmers with little or no livestock. Applications do not need to be made annually.	Labour intensive and bulky to transport (especially when holdings are dispersed). Sometimes availability is limited. Quality can be variable. Often selectively used, particularly on 'home gardens'.
3.3. Incorporating crop residues into the soil	Improves soil fertility, water holding capacity and other soil characteristics.	Not widely used (in Africa). Crop residues more often used for fodder. Labour intensive if done manually.
4. Increasing efficiency of nutrient uptake	**Advantages and relevance**	**Disadvantages and constraints**
4.1 Selecting crops to match soil fertility levels	Popular and widely used technique- which accords with mixed cropping strategies.	Requires detailed knowledge of soils and plant characteristics.
4.2 Concentrating nutrients in certain fields	Widely used in response to crop types and accessibility of different parts of the farms. Often used at a micro level – selectively improving the quality of small areas.	As above.
4.3 Managing application of nutrient to crops (organic or artificial inputs)	Makes careful use of scarce resources by fertilizing selectively, e.g. placing compost in a pit under the Zaï system.	Can be labour intensive.

From Hilhorst and Muchena (2000)

particularly, as Hilhorst and Muchena note, in remote 'bush' fields.

Organic techniques for improving soil fertility have a number of competing attractions: they often can be made on the farm (thus obviating the need to purchase inputs), their effects last for more than one year, they help improve the moisture retaining capacity of the soil and improve soil structure. Composting can also significantly help with reducing weed problems by cooking the seeds (Dalzell et al., 1987; Ozores–Hampton 1998). But in some areas competition for biomass can be severe. Overgrazing and the need for fuel (both wood and dung) can both exert extreme pressures on local bio-productivity, leading to net nutrient loss and reducing the amount of available compostable and recyclable organic materials.[46] Buerkeri et al.. (2000) argue, quite logically, that where soils have a low and declining nutrient status, recycling per se cannot add to this. They go on to argue that

in such situations, inputs of artificial fertilizers are necessary to build up soil fertility (p.21). Given that these communities are likely to be resource poor in the first place, it is not apparent how they would afford such inputs. It is not clear either, that even if they were donated, whether such inputs would represent the most appropriate form of assistance. Use of nitrogen-fixing leguminous species would arguably provide a more sustainable solution than 'fertilizer fixes.' Other soil amendments, such as rock phosphate, might be used to remedy other forms of nutrient deficiency. In eastern Africa reasearch has identified shrubs (*Tithonia diversifolia* and *Lantana camara*), which contain high proportions of both nitrogen and phosphorous in their leaves and so can make a useful mulch and address nutrient deficiencies (Niang, 1996).

Natural techniques for replenishing the soil can also be used to help stabilize swidden agriculture. In the north of Guatemala, farmers previously engaged in slash and burn have found that through planting velvet bean they can grow maize on the same fields year after year, with some long term increases in productivity (Blench 1997). In Ghana, farmers are adopting an unusual approach to stabilizing fertility – one involves densely planting *Leucaena* trees (up to 30,000 per hectare) and lightly burning them every year- a practice which has enabled farmers to grow maize on the same land for 20 years in succession (ibid.).

Organic and agroecological systems certainly do not provide panaceas for areas with depleted and declining nutrient status. However, as two of our case studies (in Burkina Faso and Tigray) show, they can significantly help address problems of declining soil fertility. In so doing, they focus upon building up local productive capacity (both ecological and social), rather than relying upon external inputs. Case Study 9 (over) provides an illustration of how ecological land management techniques and water conservation are helping to bring back hope to marginal farming communities in the highlands of Tigray.

Case study 9 – Ecological land restoration in Tigray

Tigray is the northernmost province of Ethiopia. More than 85% of its population depend upon agriculture. As a result of serious land degradation crop yields are low. The Tigray Agriculture Bureau (TAB) has adopted the 'Sasakowa Global 2000' package as a solution to these problems. This is based on high input-demanding varieties and chemical fertilizers. The Institute for Sustainable Development (ISD), has entered a partnership with TAB to experiment with alternative approaches including compost making and soil and water conservation through physical and biological means.

Four small pilot areas (about 50 hectares each) were selected to be representative of conditions within Tigray. Three were in, or adjacent to, mountainous areas and sparsely populated. Soil quality and fertility levels varied between the areas, being poor in two and relatively good in one. All had experienced problems of vegetation loss from hillsides and were experiencing significant problems with gullying and soil erosion. In one case, gullies were eating away at farmers' fields. The fourth area was more fertile, more densely populated and has a high cattle density. It was chosen due to its location on the edge of the only lake in Tigray. This lake is situated in a closed basin, with no outlet, has a good stock of fish and attracts many wild birds. This site was selected due to concerns that intensive agrochemical usage would harm the ecology and productivity of the lake.

TAB seconded an experienced extension worker to work as animateur and co-ordinator for these villages, who was put

through an intensive OAA orientation programme. Meetings were held in villages to identify issues and possible solutions. Many villages adopted schemes that contained similar features. Check dams were built in the gullies, wherever possible, to reduce run off and erosion. Small reservoirs formed behind these and the water retaining capacity of the soils around the gullies was vastly increased, leading to a spectacular re-vegetation of the banks and significant improvements in size and yield of crops closest to the gully. Stone bunds were introduced to slow down erosion. Trench bunds, incorporating compost, have also been constructed. Sesparai sesban bushes were planted to help fix nitrogen, provide fodder to animals and stabilize the soil.

There is very little tradition of composting in Tigray and villagers were initially reluctant to adopt this technique. Some villagers, however, were prepared to experiment, and others, seeing their success, followed suit in subsequent years. Compostable materials are in short supply, mostly derived from local weeds and kitchen waste. In some instances grass seeds were collected from hilltops and sown locally to increase compostable material. In others, villagers used small amounts of nitrogen fertiliser to encourage the growth of local grasses and form a basis for composting.

All villages have seen an increase in yields, in the range of crops that they can grow and in the vegetative structure. Farmers have learnt that they don't need to manure plots every year, as they do with artificial fertilizers. One village worked together to build a communal compost pit. They ran their own experiments in one dry season, finding that composted crops thrived (due to increased water retention capacity of the soil) but that artificially fertilized ones 'burnt out'. Although the composting levels that they are using are only half the recommended rates, yields from these fields often exceeded those from artificially fertilized ones (see Table 4.1, above).

ISD have found that it is easier to work in partnership with villages that are 'on the edge'. They have little to lose and are prepared to experiment. Even so, compensation is available if the experiment doesn't work. Most villages have well-structured committees who will discuss the ways and means of implementing schemes beforehand. Through discussion, potential adverse effects are more likely to be recognized. Travelling seminars and demonstration farms are proving useful methods of dissemination. On the evidence of the success of these four pilot villages, another 40 have now come forward to develop OAA solutions to environmental degradation and declining yields. TAB have agreed not to promote Sasakowa Global 2000 technologies in experimental villages and are beginning to take an interest in the potential of the schemes.

(Source: Edwards, 2000 and interview)

Strategies required to address the problems of restoring marginalized or degraded land need to draw upon local knowledge and traditions, upon experience of dealing with similar situations in other geographic locations and upon awareness of prevailing ecological and socio-cultural constraints. Steiner (1998), Scoones and Toulmin (1999), and Hilhorst and Murchena (2000) all provide examples of where such strategies have successfully been deployed.

Three further strategies for improving soil fertility are worthy of mention, although these are not discussed in Table 4.5 above. First is the use of (solid) human waste. The omission of this from Table 4.5 is understandable, as this practice is extremely rare in Africa, due to cultural aversion for working with human excrement. However in many other parts of the world, especially Asia, there is a long-standing traditions in gathering and recycling 'night soil'. We were surprised to find very little mention of this practice in our literature survey. We only

came across one paper which stressed the importance of utilizing human waste as an integral part of closing nutrient cycles (Cheong and Cheong, 2000). We can only speculate as to whether this is due to the practice being largely abandoned, or whether it is one that is rarely written about it. We suspect that it is probably the latter and feel that this is an important gap in the literature. Issues of management of night soil on different spatial scales (i.e. household, village and peri-urban), on safe composting techniques and the benefits which such practices bring appear to be very little reported. Further research, documentation and dissemination of such practices may well be of value.

A further source of fertility inputs, widely available in urban and peri-urban areas is through the recycling of biodegradable waste material. Several successful urban composting schemes have been set up in Senegal (see section 3.1 above) which utilize waste from domestic sources and markets. In much of the South the proportion of organic matter within the waste stream is relatively high. Allison et al. (1998), recently conducted a global research project on the recycling of compostable urban waste. They identify a number of successful projects as well as a range of constraints – technical, logistical and social – facing such initiatives. More recently a workshop was held in Accra on the same theme (Pay and Kunze, 1999). In other instances, compostable material is recovered from food processing activities (see for example, Kufa et al.., 2000). Solutions such as these are generally more applicable to urban and peri-urban areas, which often generate high volumes of organic waste and frequently have pressing food security needs. The intensification of local agriculture and promotion of the efficiency of kitchen gardens through the use of locally available organic waste could bring significant benefits as demonstrated by the Food Garden Foundation's activities in South Africa (Boshoff, 2000).

A third mechanism for promoting soil fertility is through the use of purchased organic compounds – e.g. concentrated plant extracts. This is unlikely to be a viable solution for poor farmers and to some extent runs against the closed cycle philosophy of organic production. Such an approach may nonetheless prove useful in rectifying mineral or nutrient deficiencies on a one–off basis. In our web searches we found several companies based in the South specializing in the manufacture of such products, providing evidence of an emerging market for these products.

In summary, there is a wide range of natural and organic techniques available to farmers for maintaining soil fertility. Their relevance to good farming practice lies not only in maintaining soil fertility, but also helping to build soil structure and water retention capacity. The use of manure, mulches, composts and nitrogen-fixing species is not restricted to farmers who rely on OAA but is also widespread amongst farmers who use agrochemicals. The benefits of such techniques are widely appreciated by farmers of all types across the world. Improving knowledge about, and access to information concerning the efficacy of different techniques is likely to have widespread benefits for the global farming community. Two projects currently under way offer the promise of substantially improving access to knowledge in this field. One, a joint programme between Wye College and UNESCO's Tropical Soil Biology and Fertility Programme in Nairobi, is building an organic resource database containing details of nutrient content, decomposition rates and other key features of tropical plant species which can be used for compost. Its aim is to advance soil fertility improvement from empirical knowledge to predictive practice. To date it has tested and registered over 300 plant species and is inviting contributions from other researchers (Palm et al.., 2001). At the time of writing the FAO is currently planning a comparative survey of the

performance of different organic fertilizers (FAO 2001). Both these programmes are likely to contribute to increasing the availability of information on the relative benefits of the use of natural techniques for maintaining soil fertility, thereby promoting the objective of developing closed cycle farming systems.

4.4 – Natural regimes of pest and disease control

Regimes of pest and disease control under organic management systems are highly context specific: different diseases and pests may attack different crops under different climactic conditions. In view of this, this section of the report does not set out to provide a comprehensive guide to pest and disease control. Rather, it seeks to identify some general principles of organic methods of pest and disease control and illustrate these with some specific examples. In so doing it draws heavily upon what is considered to be the authoritative guide to natural crop protection in the tropics (Stoll, 2000).[47] [48] Aimed primarily at fieldworkers, the book is divided into four main sections. The first provides guidance on how to recognize and guard against crop specific pests. The following two sections of the guide examine methods of protection in the field and in storage. The final section provides case studies of participatory research projects that have enabled farmers, extension workers and scientists to develop new approaches to pest control. The appendices of the book contain more than 700 references to scientific papers, and identify more than 60 web sites related to integrated pest management (IPM), entomology, plant toxicology, ethnobotany and methods of storage protection.

Preventive measures in the field

Some examples of pest and disease management in the field have already been described in earlier sections of this report. They include inter-planting and the use of repellent and trap crops. In general, OAA relies upon preventive measures of pest control in preference to curative ones. Stoll (ibid. pp. 88-92) identifies nine main principles of preventive crop protection, summarized below.

Knowledge of agroecosystems: the agricultural ecosystem and the environment in which it is embedded are the primary factors determining pest pressure on crops.

The following aspects are of particular importance:

- The biology of pests and their enemies, including life cycles, breeding behaviour, feeding habits, etc.
- the seasonality of pests and their enemies
- the season and stage of development when plants are most susceptible to attack
- conditions (climatic and physical) under which pests thrive
- alternate host plants, which will attract a pest away from a crop, or harbour the pest at other times of the year.

While farmers may have some knowledge of these issues, they will rarely have it all. For example, farmers' knowledge about the life cycle and habits of predators is often far from complete, or they may not know about certain forms of pathogen that can control or repel pests. In such situations, the exchange of different forms of knowledge, local and scientific, can generate new methods of dealing with specific problems. It can also lead to farmer experimentation on the most effective ways of applying solutions that have been found to be useful elsewhere. The methods used to exchange knowledge and engage farmers in this process are particularly important. Stoll's book contains eight case studies on how synergies between local and

scientific knowledge have been generated (ibid. pp. 264-338). Elsewhere in the organic and agroecological literatures a great emphasis is laid on participatory approaches to exchanging knowledge, reflecting the general importance of using appropriate mechanisms for teaching and learning.

Healthy plants and soils: Plants that are over or under-nourished are more prone to infestation. There is a close relationship between the physiology of a plant, its location, soil structure, nutrient availability, type of agricultural practice and infestation. According to Chaboussou (1987, cited in Stoll, p. 89), plants with high levels of water soluble substances, such as sugars, amino acids and glycosides in their cells are more prone to attack as pests prefer to feed on these substances. Field trials in Latin America suggest that crop infestation by stemborer, fall army worms and aphids is encouraged by high levels of application of nitrogen fertilizer (van Huis, 1982, cited in Stoll, 2000). Farmers in Latin America have found that incorporating organic matter into the soil provides an effective means of avoiding attack from white grub, which ignores the roots of crops if there is sufficient organic matter in the soil. The relationship between soil treatment and the susceptibility of plants to pests and disease is explored in more detail in a number of papers in Allen and van Dusen (1986, pp. 553-606).

Natural rhythms and optimal planting times: Outbreaks of pests and diseases are often associated with particular climatic conditions that may correspond with vulnerable stages in the life cycles of a crop. Knowledge of the life cycles of pests and disease can help farmers plan their planting so as to minimise damage. Different strategies may be employed and Stoll identifies several examples. In South East Asia, traditional rice growers only plant one crop in the rainy season (even though it is possible to harvest twice), so as to interrupt the life cycle of the rice stemborer. Similarly, in Ghana, farmers only plant maize in the main rainy season, as the crop suffers high infestation from stem borer in the lesser rainy season.

Crop rotation: This is one of the key features of OAA, important both for maintaining soil fertility and controlling pests. It is particularly effective for controlling pests that live within the soil, such as nematodes, wireworms and cutworms. Rotation interrupts the life cycle of these pests and helps prevent their numbers building up to a critical mass that could severely damage a crop. Rotation is also an important strategy for maintaining soil fertility.

Mixed farming and diversification: Intercropping strategies, using 'companion planting' techniques can be used to deter pests. These can work through a number of mechanisms:

- Physically camouflaging the main crop, e.g. planting bean seedlings amongst rice stubble, or beans amongst maize. In Colombia, damage to beans from jassids is reduced by two thirds by planting maize 20-30 days before the beans: the maize provides shelter for the beans, making it harder for predators to identify them (Stoll, 2000 p. 90).

- Creating mechanical barriers that restrict the dispersal of pests. For example, grass borders deter leafhoppers and in West Africa farmers dig small, steep sided pits to provide physical traps for grasshoppers (Kinnon and Bayo, 1989).

- Creating physical environments which discourage pests: for example aphids are more attracted to cole crops grown on a bare soil, as opposed to a weedy or more diverse background; red and opal coloured plants deter some types of insects; mixing plant leaf shapes and textures can also deter some pests.

- Masking or diluting the attractant stimuli (e.g. leaf shape, texture, or scent) of host plants.

- Producing repellent chemical stimuli e.g. the strong odours of garlic, leek, coriander or basil.

- Diverting the pest to a more attractive 'trap crop'. For example, fruit borers can be attracted away from tomatoes by marigolds.

Host plant resistance and tolerance: In natural systems plants rely upon their own defences to ward off predators. These may include chemical defences which are bitter tasting and/or toxic. These self-defence mechanisms may take many forms: pests may be deterred from feeding or laying eggs on these resistant varieties, they may sicken after feeding on the host plant, or the host plants may be able to tolerate feeding and recover again. However, the orientation of breeding programmes towards high-yielding varieties has contributed to a loss of these self-defence mechanisms. Seed exchange networks, which preserve indigenous varieties that may have pest resistant characteristics, are a useful mechanism for maintaining and distributing these more robust varieties. Science can also play a role in helping develop pest resistant varieties (for example the development of *Ruiri 11,*discussed in section 4.2. above). However, the development of successful breeding programmes for such varieties is a costly and lengthy process (Hillocks et al.., 1996 cited in Stoll, 2000)

Managing natural enemies: Maintaining diversity within an agroecosystem can also help provide habitats and food sources for the natural predators of pests. By managing the farm environment in this way, the farmer can effectively recruit an 'unpaid army of farm workers', who will undertake much of the work involved in managing pests. For example, experiments from the University of California found that cultivating strips of alfalfa increased the population of insect-eating spiders by a factor of ten (Rincon-Vitova, 1995, cited in Stoll, 2000 p.91).

In many areas ants have been found to be effective in managing a range of different pests. Sugar solutions can be used to attract ant populations (as well as other useful predators, such as ladybirds and spiders). In one experiment in the Honduras, sugar water solutions were applied weekly for the first five weeks after the maize crop emerged. On average twice the number of predators were found in the treated areas as in the untreated ones, leaf damage was 35% less in the treated areas and whorl infestation was 18% less (Cañas and O'Neil, 1998, cited in Stoll, 2000). Indian farmers employ a similar practice of using a combined sugar/ghee solution to attract ants to control beetles preying on mango trees (Gupta and Patel, 1991, cited in Stoll, 2000).

Farmers in Vietnam use weaver ants to control citrus pests. In two years of trials the ants have been shown to reduce infestation by citrus stinkbug by 94%, of swallowtail butterfly larvae by 92%, of citrus aphids by 67%, and to reduce leafminer damage by 12%. In addition, crops with a weaver ant presence also yield shinier fruit, and have greater appeal to consumers (Stoll, 2000, p.99). In Tanzania, farmers also use weaver ants to protect fruit crops and encourage them to them colonize trees by building artificial 'bridges' with steel or plastic wires (ibid. p.100). In Kenya, farmers facing infestations of caterpillars and grasshoppers will set traps for soldier ants and release them in the area that they want cleared (ibid.). In other places farmers attract birds to control natural predators. In India, turmeric rice is used to attract birds to castor fields infested with castor semiloopers. When a sufficient population of birds has been attracted and the rice supply exhausted they then prey on the larvae of this pest (ibid.).

In other areas, natural predators may be bred and released into the wild in order to manage pest populations or as agents for controlling invasive weeds (see Julien, 1992 for details of potential of the latter strategy). In Cuba, different species of flies, ants wasps and bacteria are all bred and released in areas where there are specific predator problems (see case study 3). In sub-Saharan Africa one species of wasp (E. lopezi) has been identified which controls the mealybug, a major threat to cassava, one of the staple crops of the area (Kinnon et Bayo, 1989, p.67). This has been successfully released in twenty-five countries with very successful results (Schulthness et al., 1997). Hoffmann et al.. (1998) identify promising results from a programme involving the release of leaf-feeding beetles (*Leptinotersa* texana) to control the spread of silver leaf nightshade, an imported and invasive species which has caused problems in Southern Africa. Large-scale programmes such as these last two involve co-ordinating resources and research in ways that are not generally available to local farmer groups.

Field sanitation: This can be important in controlling the life cycle of pests. Measures might include the removal or destruction of prematurely fallen fruits (which may harbour pupae or larvae) and of infected harvest residues. Trap crops should also be removed at appropriate times of the year so that they do not harbour pest populations for the following year. Stoll (2000) also identifies distance between infested fields and plant nurseries as a factor that can contribute to cross-infestation.

Social (collective) action: Some pests range over large territories and their numbers cannot be managed effectively by farmers working individually. Stoll illustrates how variegated grasshopper populations can be controlled by seeking out and destroying their nests (usually no more than 1 per square kilometre). If done effectively over a large area this can reduce numbers by 70-80%. Similarly in Vietnam in 1997-8 the government conducted a national campaign against rodents, encouraging people to catch them and substantially reducing rodent numbers.

Protecting newly planted seeds: One of the most vulnerable times in the cropping cycle is when seeds have just been planted. Farmers adopt a range of mechanisms to increase the chances of survival of freshly planted seeds. In many countries, food particles are scattered around or over seedbeds when they have just been planted to provide an alternative food source for ants. Farmers find that the smaller the particles of food, the more effective the strategy in ensuring that ants are kept away from the crop (Stoll, 2000, p. 97).

It is common to soak seeds in water for a few days before planting them. This gives them a small head start, and means that the seedbeds have to be protected for less time. In parts of West Africa, farmers select seed by soaking them in a 10% salt solution with the ones that float being discarded as damaged or diseased (Njai, pers. comm.). In the same area seeds are often mixed with ash to give them a darker colour and make it more difficult for birds to find them. They may also be soaked in a water/neem leaf mixture to make the seeds taste bitter and unattractive to termites and other pests (Kinnon et Bayo, 1989). Stoll reports a number of methods of pre-treating seeds before planting in order to make them less attractive to a range of pests. These involve soaking seeds in infusions of plant extracts (such as neem, gliricidia, papaya, sweet flag), cow dung slurry or petrol (in minute quantities), in order to make them less palatable to pests.

Botanical defence systems

In addition to these preventive measures a number of plants are known to have pest and disease controlling properties. These plants can often be grown locally and the relatively simple preparations made in situ

by farmers themselves. Stoll identifies a range of plants and plant extracts, used in different parts of the world to control insects and other pests. Table 4.6 (over) identifies the plants most commonly used to control pests and diseases within the tropics.

Methods of storage protection

In areas of the world lacking modern day storage facilities, such as refrigeration or controlled temperature/humidity granaries the threat of losing crops after harvesting remains a significant one. According to FAO estimates around 15% of annual global food production is lost in storage, almost half of that lost to pests and diseases in the field (FAO, 1998, cited in Stoll, p. 10). Whilst often overlooked in the literature, storage techniques remain a critical component in terms of promoting global food security.

Many of the principles involved in successful food storage start in the field. Harvesting at the correct time, when crops are less likely to become damp, and eliminating infestations that may already have occurred in the field are both critical factors. Choice of appropriate species and varieties is also important. For example, some farmers prefer traditional varieties of maize, as the cob husks have a more closed profile than modern day hybrids and provide better natural protection from maize weevil infestation. For grain, relative humidity is a particularly important factor. Stoll (2000, p.231) suggests that grain should be stored at a humidity level of between 8-10%. Beyond this level the possibility of insect infestation greatly increases. At 13% humidity the risk of mould developing is greatly increased. (after Stoll, 2000)

Farmers often use a range of drying techniques. The simplest of these is exposure to sun and wind. Other more capital/labour intensive techniques, such as heating in simple ovens, boiling and drying, or use of solar drying equipment can all be employed to accelerate the drying process or make it more effective. Farmers may treat only part of their crop in these ways, using less intensive methods for crops intended for short and medium term domestic consumption and paying extra regard to that portion of the crop destined for longer term storage (e.g. seed for next year).

Storage facilities may vary in size and scope, from communal buildings (such as the rice barns constructed by the World Food Day Farmers' and Fishermen's Movement in Indonesia – see case study) to home built sandpits or even gourds. Hygiene is always at a premium. The removal of old stored produce, thorough cleaning and protection from damp and rodents are all essential preparations. Checking produce and removing damaged or potentially infested grain/vegetables is also an important precaution.

A number of different preventive approaches to infestation can be employed. Several plants identified in Table 4.6 (above) are effective against storage pests. Basil is used in several countries to suppress bean bruchids. Chilli is used in many forms to prevent crop infestation. In Nigeria, farmers protect cowpeas by sprinkling chillies among them. In the Philippines, farmers dry and fumigate their grain at the same time by adding chillies to the fire used for drying. The fish bean plant is used to control bruchid infestation in Zambia and, in Latin America, muña is widely used to protect stored potatoes. Neem, sweet flag and velvet leaf are other botanical sources used in differing quantities to protect against post-harvest infestation (examples from Stoll, 2000, pp 235-252).

Vegetable oils are often also used as a mechanism for reducing risk of infestation. They include oils made from coconut, cotton, sesame, neem and other locally-available species. Some of these oils have a toxic effect

Table 4.6 – Plants with pest-controlling properties

Field insects	A	B	C	D	FB	Ga	Gi	Gl	IP	MI	Mm	Mg	N	Pa	PL	Po	Py	Q	R	S	SF	Ti	To	Tu
American bollworm				x		x	x						x		x				x			x		
Ants			x		x								x											
Aphids	x		x	x	x	x	x	x			x	x			x	x	x	x		x	x		x	x
Armyworm				x		x									x	x				x	x			x
Asian corn borer				x											x									
Avocado lacebug																				x				
Banana pseudostem borer												x												
Bean aphid																						x		
Bean fly																	x							
Bean pod borer													x											
Bean pod weevils			x					x				x												
Beet armyworm																								x
Beetles																	x							
Black carpet beetle																		x						
Black rice bug																						x		
Blister beetle			x					x																
Brown planthopper															x	x						x		
Brown rice planthopper	x												x											
Bunch caterpillar													x											
Cabbage aphid															x									
Cabbage looper				x							x									x				
Cabbagehead caterpillar				x	x																	x		
Cabbage worm													x							x			x	
Castor caterpillar									x						x									
Caterpillars	x		x	x				x				x					x	x					x	x
Chrysanthemum aphid	x																							
Codling moth																			x					
Citrus aphid																x								
Citrus leaf miner													x		x	x								
Citrus psyllid															x									
Citrus red mite															x									
Citrus scale															x									
Citrus thrips																			x					
Cockchafer grub													x											
Cockroaches																				x				
Coffee grubs																	x							
Coffee greenscale	x															x								
Colorado beetle			x			x							x				x	x						

Key: A – Annona; B – Basil; C-Chilli; D – Derris; FB – Fish Bean Tree; Ga- Garlic; Gi – Ginger; Gl –Gliricidae; IP- Indian Pivet Tree; MI – Malabar; Mm – Mammey; Mg –Marigold; N – Neem; Pa –Papaya; PL – Persian Lilac; Po – Pongam; Py – Pyrethum; Q –Quassia; R – Ryania; S – Sabadilla; Sf – Sweet Flag; Ti – Tinospora; To – Tobacco; Tu – Turmeric.

Field insects	A	B	C	D	FB	Ga	Gi	Gl	IP	Ml	Mm	Mg	N	Pa	PL	Po	Py	Q	R	S	SF	Ti	To	Tu
Corn rootworm											x													
Cotton stainer	x	x		x		x															x			
Cotton semilooper																								x
Cucumber beetle					x						x													
Cutworms					x				x				x									x		
Desert locust													x											
Diamondback moth	x		x	x	x				x		x	x	x				x	x	x			x		x
Eggplant fruit & shoot borer															x									
European corn borer																			x	x				
Fall armyworm			x					x					x											
False codling moth						x																		
Fleas																					x			
Flea beetle				x	x								x				x			x		x	x	
Flower thrips														x										
Fruit flies		x		x										x										
Gall midge																	x							
Gram pod borer													x											
Grasshoppers					x							x					x			x				
Green bugs,	x																							
Green leafhopper															x	x	x					x		x
Green peach aphid														x										
Green rice leafhopper,	x												x		x									
Green scale				x																				
Green stinkbug																				x				
Hairy caterpillar									x															
Hairy chinchbug																				x				
Houseflies						x																x		
Imported cabbage worm						x					x				x		x		x					
Large cabbage worm																	x				x			
Leaf beetle												x												
Leaf bug																			x					
Leaf cutting insects			x																					
Leaf eating caterpillars																				x				
Leaf hoppers												x	x											
Leaf miners		x											x					x					x	
Locusts																	x							
Maize stalk borer		x																						
Maize stemborers																x			x					
Mango leafhopper				x																				
Mealybugs																		x						

Key: A – Annona; B – Basil; C-Chilli; D – Derris; FB – Fish Bean Tree; Ga- Garlic; Gi – Ginger; Gl –Gliricidae; IP- Indian Pivet Tree; Ml – Malabar; Mm – Mammey; Mg –Marigold; N – Neem; Pa –Papaya; PL – Persian Lilac; Po – Pongam; Py – Pyrethum; Q –Quassia; R – Ryania; S – Sabadilla; Sf – Sweet Flag; Ti – Tinospora; To – Tobacco; Tu – Turmeric.

Field insects	A	B	C	D	FB	Ga	Gi	Gl	IP	Ml	Mm	Mg	N	Pa	PL	Po	Py	Q	R	S	SF	Ti	To	Tu
Mediterranean fruitfly	x			x																	x			
Melon aphid				x																				
Melon fly																					x			
Melon worm																		x	x	x				
Mexican bean beetle						x							x		x									
Migratory locust													x		x									
Mites						x					x		x				x	x					x	x
Mosquito																					x			
Moths																	x							
Mustard sawfly																					x			
Onion thrip						x																		
Oriental fruit fly	x																					x		
Oriental fruit moth																		x						
Pink bollworm															x									
Potato aphid	x																							
Potato jassid																				x				
Potato tuber moth						x									x	x								
Red ants																						x		
Red coffee mite													x											
Red crevice tea mite										x			x											
Red pumpkin beetle,	x																							
Red spider mites		x																						
Red tea mite										x														
Rhinoceros beetle													x											
Rice bug																						x		
Rice caseworm																x								
Rice gall midge													x		x									
Rice leaf folder													x									x		
Rice leaf roller																								x
Rice stalkborers													x											
Rice stemborers									x						x							x		x
Rice thrips																						x		
Sawflies																		x						
Scales			x										x											
Silkworm																		x		x				
Slugs			x																					
Sorghum shootfly						x																		
Southern armyworm	x																							
Squash bugs				x															x					
Spider mites					x																			

Field insects	A	B	C	D	FB	Ga	Gi	Gl	IP	Ml	Mm	Mg	N	Pa	PL	Po	Py	Q	R	S	SF	Ti	To	Tu
Stemborers													x										x	
Stink bugs				x																x				
Sweet pepper weevils								x																
Tent caterpillar																				x				
Termites					x			x					x											
Ticks					x																			
Thrips				x			x						x				x			x			x	
Tobacco budworm															x									
White backed rice planthopper		x												x		x								
White cabbage butterfly				x											x									
Whitefly			x			x	x	x					x			x								
White grubs								x																
Wireworm						x																		
Rodents								x																
Nematodes																								
Root knot nematode							x					x												
Various																x								
Field diseases																								
Bacteria						x																		
Bacterial blight						x																		
Basal stem rot													x											
Bean anthracnose						x																		
Brown leafspot on rice						x	x																	
Brown rot						x																		
Coffee berry disease												x												
Coffee rust														x										
Cucumber mosaic virus			x																					
Cucumber ringspot virus			x																					
Cucumber scab						x																		
Downy mildew						x																		
Grey leaf spot													x											
Kasahui (fungal disease of potatoes)																					x			
Leaf curl virus																							x	
Leaf rust														x										
Mango anthracnose							x																	
Mosaic virus														x										
Powdery mildew													x	x										x
Rice blast												x												
Rust in beans and wheat																							x	
Tobacco etch virus			x																					

Key: A – Annona; B – Basil; C-Chilli; D – Derris; FB – Fish Bean Tree; Ga- Garlic; Gi – Ginger; Gl –Gliricidae; IP- Indian Pivet Tree; Ml – Malabar; Mm – Mammey; Mg –Marigold; N – Neem; Pa –Papaya; PL – Persian Lilac; Po – Pongam; Py – Pyrethum; Q –Quassia; R – Ryania; S – Sabadilla; Sf – Sweet Flag; Ti – Tinospora; To – Tobacco; Tu – Turmeric.

Field insects	A	B	C	D	FB	Ga	Gi	Gl	IP	Ml	Mm	Mg	N	Pa	PL	Po	Py	Q	R	S	SF	Ti	To	Tu
Tobacco etch virus			x																					
Tobacco mosaic virus			x																					
Tobacco ringspot virus			x																					
Tomato blight												x												
Viruses (not specified)													x											
Fungal diseases																								
Asperhillus flavus		x																						
Pyriculria oryzae				x																				
Storage insects																								
Aduki bean weevil							x		x							x								x
Angoumois grain moth									x							x								
Black carpet beetles																			x					
Bruchids					x																			
Cowpea weevil													x											x
Grain weevils															x									x
Khapra beetle													x											
Large grain borer					x																			
Lesser grain borer		x											x		x	x								x
Maize weevil		x			x								x											
Red flour weevil																x								
Rice flour weevil																			x					x
Rice weevil									x		x		x			x								x
Saw toothed grain beetle																x								
Warehouse moth															x									

(after Stoll, 2000)

on the predators themselves, others inhibit the hatching of eggs and all make it harder for eggs to be laid on the grains of the treated crop.

Inert dusts, including sand, wood ash, kaolin and paddy husks are often used as a traditional method of storage for grains and vegetables. Their wide availability and the low opportunity cost involved in gathering them make them a particularly attractive storage medium for poor farmers. For example, in West Africa, farmers store beans in fine sand to protect them against beetle infestation (Kinnon et Bayo, 1989). Fine-grained particles such as these are effective in inhibiting the movement of insects and pests, reducing their chances of breeding and of laying their eggs widely. Some fine-grained particles abrade the skin/shell surfaces of pests, thus further weakening them. In Benin, farmers use a combination of these techniques, mixing dry earth and chillies to protect their bean harvest. As with other organic techniques and methods, experimentation and communication are key factors in promoting and disseminating good practice for the management of both field and storage pests.

4.5 – Markets and premia

There has been a noticeable and rapid growth in the demand for organic food in recent years, with the biggest markets and fastest growth rates occuring in the industrialised world: the USA, Japan and particularly the EU. Demand for organic produce in some Northern countries has almost doubled in the past three years, and some estimates suggest that the organic share of total food retail sales could increase from 1% to 10% over the next ten years (International Trade Centre 1999). Such growth rates in food demand are almost unprecedented, and the organic sector is inevitably attracting many new entrants. Large multinational companies including Nestlé, McDonalds, Novartis, Heinz, Kraft, Unilever and General Mills are beginning to develop organic lines or buying up existing organic processors (Willis and Yussefi, 2000; Pollan, 2001). In Germany, 80% of baby food is now organically produced and 30% of all bread distributed around Munich is now organic (Geier, pers. comm.). Organic produce is no longer a niche market, but is now thoroughly in the economic mainstream.

This creates new opportunities for producers in the South to tap into potentially lucrative markets, especially through providing exotic and 'out of season' produce. This engagement with Northern markets is the main driving force behind the development of the certified organic sector in the South. Such is the demand in the industrialised world that many companies are actively seeking out producer groups to supply them. Recognition of the commercial and foreign earnings potential of export-oriented organic production provides by far the most important motivation in the South for state involvement in promoting organic production (FAO, 1998; Scialabba, 2000). It is no coincidence that poorer countries that are geographically and culturally closest to the affluent markets of the North (e.g. Turkey, Tunisia, Mexico and Argentina), are often those with the most developed organic sectors (Barkin, pers. comm.)

There is much evidence to suggest that organic certification can generate significant premia for primary producers. Table 4.6, below, provides some examples of premia achieved

Table 4.6 – Premia generated by organic producers

UNDP (1992) found that 9 out of 11 organic projects studied showed an increase in net income and only 2 a decrease. Deducting organic premia, 5 of the 11 showed higher returns than non-organic farms.
Gugal (2000) identifies a group of organic/fair trade pepper growers in Brazil who benefit from 35-40% premia.
van Elzakker & Tulip (2000) identify 15-30% premia gained by organic coffee, cotton and sesame producers in Uganda and Tanzania, with a knock-on benefit of increasing local market prices.
Cheong & Cheong (2000) describe a village that has converted to organic production and also manufactures medicinally beneficial teas made from local weeds for export to Japan. Farmers in this village earn four times as much as conventional rice farmers in other parts of Korea.
Zonin et al.. (2000) discuss a farmer-led agroecology project in the Erexim region of Brazil, which markets locally and has resulted in significant increases in farmers' incomes in an area previously subject to significant rural exodus as a result of lack of opportunities.
Faisal (pers. comm.) describes how rice grown on his own farm achieved a 30% premia on local Indian markets because of its better taste and quality, although it was not formally certified as organic.
Hardy (pers. comm.) describes an organic rosewater co-op in Iran, which is more profitable than previous poppy growing related activities.
Myers (pers. comm.) describes a herb growing project in a remote and often inaccessible part of Kenya (Meru) which is so successful that it is attracting economic migrants back from the slums of Nairobi.

by organic growers, mostly from export markets but occasionally from domestic ones.

Despite these encouraging examples, there is an inherent danger in embarking upon a transition to organic farming solely because on the promise of premia for certified produce. First, certification can often be a difficult obstacle to negotiate (see following section). Second, as commodity producers have found to their cost in the past, dependency on export markets is not risk-free. A decline in the rate of growth of demand in the rich world, a rapid expansion of supplies from the South and the possibility of certification procedures being discredited,[49] could all (singly or in combination) potentially undermine the benefits currently accruing to export-oriented organic producers.

Organic production systems do however offer some cushion against the vagaries and centralizing tendencies of global markets. The nature of organic farming, with its emphasis on mixed systems, means that farmers are less likely to be solely reliant upon one crop and less exposed in times of crop failure or oversupply and low prices. Because organic farming relies more on locally-available natural resources and labour inputs than conventional agriculture, the benefits are likely to be more equitably distributed than under more capital intensive systems. And in some instances farmers growing 'minority species' (who are more likely to be small-scale producers in marginal areas) can, through niche marketing, achieve additional competitive advantage through selling organic 'exotics' (Blench, 1998). For example, in Latin America Mayan Indians accrue such advantages through marketing organic Aloe Vera and Mayan oranges, a thin-skinned and very sweet variety, which are often processed into jams and preserves (Neugebauer and Mukul-Ek, 2000).

In many other respects however, organic agriculture in the South suffers from the same structural handicaps as its conventional counterpart. The overwhelming majority of organic produce from the South is sold as unprocessed commodities or primary processed foodstuffs. International trade tariffs, lack of capital to develop processing facilities, and to a lesser extent, a lack of awareness of rigorous levels of quality assurance expected by Northern customers, all present significant barriers to producers in poorer countries being able to add value to their produce. While there are some exceptions to this rule (for example high-value added phytoceuticals, aimed at niche health markets), the structure of the global trading economy makes it problematic for producers in the South to engage with anything more than primary production.

A further handicap to engagement with world markets is the general lack of infrastructure in many parts of the South. Several survey respondents identified poor accessibility and communications as major barriers to entry into export markets. This is a particular problem for landlocked countries in Africa (Schwarz, pers. comm.), but one that occurs in many remote regions. In parts of China, where much organic tea is grown, the harvest has to be carried down the mountain by hand or pack animal (Lamin, pers. corr.). Equally, in the Gambia one attempt to establish an intensive farm up-country foundered because of the quality of the roads: *'they were sending out crates of tomatoes from the farm, but it was nearly purée by the time it arrived in Banjul'* (Njai, pers. com.).

Access to primary processing facilities and a focus on high value-to-volume ratio can help overcome some of these obstacles. The Meru region of Kenya is often inaccessible during the rainy season but a project for growing and drying herbs that can be delivered in the dry season when the roads are passable is improving the incomes and opportunities for the local community (Myers, pers. comm.) Simple processing facilities can open up new market opportunities. SAFLEG, in Togo, grow and dry organic pineapple for export as

'health' snacks and muesli ingredients. With juicing machinery they are able to use 'outgrade' fruits to produce fresh juice for local markets (Centre for the Development of Industry, 1999). Simple processing facilities also have other benefits. They permit longer-term storage, an important factor in areas where access is an issue. They can also bring ecological benefits. Primary processing facilities, close to point of production, will generate significant quantities of compostable waste material that can be used to help maintain soil fertility instead of being exported out of the region or country (see for example Anobah 2000; Kufa et al.. 2000).

The importance of developing processing facilities was highlighted in several responses to our survey.[50] Soita (pers. comm.) wrote of the substantial benefits to farmers within the HOPE Foundation in Kenya, who had been able to acquire small hand-powered mills to process sunflower seeds into oil. This enabled farmers to gain a far better return on their produce than they would otherwise receive from selling to a 'middleman'. Simple technologies such as these can vastly improve the earning capacity of small-scale farmers. In many cases, the difficulties involved in obtaining credit and sometimes accessing appropriate machinery often pose serious handicaps to realizing this potential.

Several projects have recently been established to develop local value-adding capacity in the organic sector. In West Africa, pilot centres for technological training in organic food processing have been set up in Ghana, Burkina Faso and Senegal (Anobah, 2000). In Mali, an association for naturally drying mangoes intended for domestic and export markets has been set up (Crole-Rees, 2000). In the High Andes, efforts are being made to process fruits into conserves, which have better storage life and are more readily marketed (Zaurez, 2000). Recognizing the importance of this part of the food chain, the FAO is planning to undertake research into organic methods of storage and processing (FAO, 2001).

There is a growing awareness of a pressing need to stimulate and develop local markets within producing countries (Guivant, et al.. 2000). In Egypt, Sekem have pursued a strategy of developing local markets and capacity for value-adding (see case study 10, over). There are however, evident difficulties in building markets in countries where the vast majority of people live in poverty and often struggle to satisfy basic nutritional needs. Equally, in much of the South there may not be a strong awareness of the difference between conventionally and organically produced crops. These issues notwithstanding, many poorer countries do have urban elites who may be prepared to pay extra for the health, environmental or taste benefits of organic produce. One study in Santa Grossa (Brazil) found that *'most consumers were prepared to pay 20-30% premia and change their shopping habits in order to have agroecological produce'* (Santos et al.., 2000) [our emphasis]. Interestingly this report found that one of the key determinants of people's willingness to pay was concern over the health impacts of agrochemical use on farm workers, an issue which rarely surfaces in discussions about the benefits of organic production in the industrialised world. In Senegal, one commentator found that some people prefer organic potatoes, as ones grown with fertilizers are thought to be too 'fluffy' (Kenton, pers. comm.).

Tapping into consumer loyalties through a combination of taste, health and philanthropic concerns does not necessarily require certification, especially where relatively direct marketing links can be established between producer and consumer. Such links might more readily be achieved in the South, where food supply chains tend to be shorter and relatively little processed food is consumed. There are reports of informal,

trust-based, organic distribution networks springing up in many poorer countries, including Senegal, (Anon, 1999) Brazil and Argentina (Florit, 2000; Willer and Yussefi, 2001) and India (Baksi, 2001).

The ability to tap into premia exports markets in the rich world may be a key driving force behind the expansion of organic agriculture in the South at present. However it is not the only benefit that accrues to producers. As one group of farmers in Madhya Pradesh (India) testifies:

'(When) asked what they would do if there was no premium paying buyer for their organic produce, they stated very emphatically that they were producing better, cheaper crops under their present system and it would not matter if they were not attached to an export chain.' (Caldas, 2000a).

Case study 10 – Sekem (Egypt)

Sekem (meaning life force) is an Islamic cultural and social movement, based in Egypt, in which biodynamic farming plays a key role. The Sekem Farm was founded in 1977 on 70 hectares of desert near Cairo. Under the guidance of a German agronomist, biodynamic methods adapted for their effectiveness in arid zones were employed. This former desert site is now a thriving farm supporting crops, livestock and bees. Sekem has developed an organic agriculture advisory service (the Egyptian Biodynamic Association), which through its extension programmes, has contributed to the conversion of more than 150 farms covering 4,000 hectares to biodynamic farming practices. In partnership with two international organic organizations it has developed an independent inspection and certification body, the Centre of Organic Agriculture in Egypt (COOA), subsequently appointed by the Egyptian Ministry of Agriculture as the national accredited inspection body.

Sekem's activities are not restricted to agriculture and extension work, and it has also been involved in value adding activities. It has established its own fruit and vegetable packing company that exports to the EU. It cultivates plants with medicinal properties and has secured a licence with Weleda to manufacture and market cosmetics in Egypt. It cultivates and manufactures phytoceuticals and essential oils. It was also one of the first organizations in Egypt to start growing cotton organically, again adding value by manufacturing and exporting finished garments. It now markets these products under four separate brands and is established as a 'brand leader' in these fields in Egypt.

Sekem is also actively involved in developing domestic markets for its food, herbal remedies, cosmetics and clothes. It operates its own shops in the suburbs of Cairo and its products can be found in thousands of shops across Egypt. More than 65% of its produce is now sold domestically, distancing it from the uncertainties of the global marketplace.

With more than 2000 employees, Sekem is actively involved in cultural and social development programmes, as well as providing benefits such as clinics, schools and kindergarten to its members. It is widely viewed as a major force for social change and improvement within Egypt, the basis of which is rooted within its successful biodynamic agriculture and associated activities.

(Source: Maxted Frost 1997, Abouleish, 2001).

4.6 – Certification

Certification is at the very heart of the process of increasing organic produce's value, at least within market economies. As with all forms of quality assurance, organic certification serves to protect the propriety and reputation of the products concerned. Only through certification can the standards associated with organic farming be protected from dilution and misrepresentation. Yet at the same time,

it can also raise barriers to market entry. This aspect of certification is particularly keenly felt in the South, where the cost, complexities and logistics of the systems are frequently seen as providing real barriers to participation in organic markets. This issue was the focus of much debate at the most recent IFOAM conference (Alföldi et al. 2000), where some commentators likened the new certification agencies to *'a new breed of missionaries and settlers'* (Boersma, 2000). There is also a widespread view that the *'interpretation of certification can be and is used as a trade barrier'* (Suma, pers. comm.) and that '*existing approaches do not lend themselves to participation by Southern stakeholders'* (Blowfield, 1999). Yet certification is a necessary process, required to justify the premia that consumers are prepared to pay for organic produce and which producers benefit from. Indeed the issue of certification and standards is so important that a new journal dedicated specifically to the topic has just been published.[51]

To understand the issues surrounding certification systems, a brief discussion of the mechanisms through which they operate is required. By way of example we focus upon the European Union, which has the longest established international standard, granting access to the world's largest organic market. For producers located outside the EU the legislation can be particularly complex. It offers three routes for organic producers from outside the region who wish to gain access to European markets. The first of these, intended as the principal mechanism, is for produce from 'Listed Countries'. To achieve this status, countries must have enacted legislation equivalent to EU standards and established a recognized certification body. Once approved by the EU these bodies can then undertake all necessary inspection work and issue certificates for all consignments. However, the application process is lengthy, and ten years after the EU legislation was passed only one Southern country (Argentina) has acquired this status (Suma, 2000). A few countries, including China and Mauritius, are in the process of applying for Listed Country status. Most countries have yet to pass relevant legislation although some are in the process of doing so (Lernoud, 2000).

Producers in Listed Countries have a relatively quick and cheap method of accessing European markets. It does however require that government takes an interest and becomes involved in establishing a regulatory framework. Yet few governments in the South view the promotion of organic production as a priority. Many see it as a marginal activity, whose potential does not warrant the time and expense necessary to put such structures in place. In other countries, still committed to agricultural 'modernization', the organic message may fall on deaf ears. In such cases producers have to pursue other avenues to secure market access. A second approach available to producers in the South is the licensing of individual inspection bodies to operate in a third country at the request of an EU member state. This approach has only been used on one occasion (in Turkey) and the implications of it have not yet been fully explored. In principle this method should offer similar benefits to Listed Country status (Suma, 2000).

A third approach, known as the 'back door mechanism', was designed as a derogation for importers but now accounts for 80% of organic imports into the EU (ibid.). Under this system, importers within member states may market organic produce if they can prove that the produce has been inspected by a system equivalent to the EU regulation. This creates opportunities for registered certifiers in industrialised countries to act as brokers for importers, either by directly inspecting producer groups and issuing certificates or by setting up branch offices in the South. As individual certifiers and EU

member states have slightly differing regulations, this can create a complicated regulatory environment for producers. For example, import licences to individual groups are issued for different time periods, ranging from five years to less than one year. The problems involved in gaining certification can lead to expensive and time-consuming problems for producers (see in particular, Wilhelm 2001).[52] Nycander (2000) recounts one such incident:

'In September 1999, the first organic certified Robusta coffee in Uganda was ready for export. But when import clearance in the EU was held up, the customer lost interest. Five months later the two containers were still at the factory in Kampala.'

A number of different and sometimes controversial issues surround the inspection and certification processes. These include:

- the current concentration of internationally recognized certification bodies in the North
- the difficulty of agreeing protocols for inspection (particularly for large co-operatives)
- the difficulties that producer groups have in coming to terms with the detailed paperwork necessary to satisfy certification proceedings
- the extent to which organic standards should incorporate social criteria (and thereby develop synergies with fair-trade labelling)
- a broader range of ethical issues surrounding organic production, related to issues such as food miles and 'seasonality'.

The remainder of this section addresses these issues in turn.

One of the main issues of contention surrounding organic certification at present is the concentration of competence in certification in industrialised countries. Of the sixteen accreditation bodies recognized by IFOAM, only three are located in the South (one each in Argentina, Bolivia and Brazil, IFOAM 2001).[53] The lack of certification capacity in the South raises cost and logistical barriers for producers. The cost of certification, almost invariably the responsibility of 'First World' certifiers can be prohibitively expensive for many small 'Third World' producer groups. Even when locals are employed to do much of the inspection work, average external inspectors' costs of around $300 per day (plus travel expenses) are considerably more than the annual incomes of many of those whom they are inspecting. Fonseca (2000) estimates that the cost of certification for small-holders in Brazil varies between 0.5 and 2.5% of business turnover, making it difficult for some of them to maintain organic status.

Two different approaches to reducing the scale of this problem are currently being developed. In many instances industrialised country certifiers are setting up regional offices in the South and employing local staff. This brings a number of advantages: local staff members will have more detailed knowledge of local social, agricultural and ecological practices; they will command wage levels commensurate with the value added by local organic production; and, by virtue of having local offices, the certifiers will attract more custom. Whilst certification competence largely remains a Northern monopoly, there is a growing trend for Northern-based certifying agencies to sub-contract much of the work to Southern-based offices. However, this does not negate the need for annual inspections from the 'head office'.

A second approach for driving down costs of certification (and marketing) is through the formation of co-operatives and producer groups. This is common practice in many poorer counties, particularly where there are a large number of producers in the same region producing the same export commodities. The question of how to manage the inspection of large producer co-ops has been a particularly contentious one in recent years. National (and individual certifying bodies') standards regarding the proportion of farms which should be subject to external inspection vary substantially. One the one hand there is a (natural) desire to have stringent inspection requirements before granting certification. Yet at the same time, this must be balanced by the economics of inspection. Some producer co-ops in poorer countries may include several thousand small farms, scattered across several villages over areas of up to 10,000 square kilometres (Heidi, 1999). Recent debates have focused around the question of the percentage of farms that should be subject to external inspection and the flexibility that should be attached to this.

Many certifying bodies argue that minimum percentage inspection rates are likely to be self-defeating targets. For example an inspection rate of 20% (the mid range of current figures) would impose intolerable financial costs upon a producer co-operative with, for example, 1200 members, yet would be inadequate for a co-operative of ten or twenty members. Moreover, in the reality of the South any minimum inspection rate would be likely to result in international inspectors visiting the most accessible (by road) farms and neglecting distant farms which are only accessible by foot. The danger of this scenario would be that the accessible farms would become inspection 'show farms' and that far-flung farms would be subject to minimal inspection and regulation. A consensus appears to be emerging that the best solution is to increase the capacity for internal control systems, in which every farm is inspected by local inspectors, and limiting the role of the outside inspector to that of primarily checking the efficacy of this system (Heid, 1999; Anon 2001b). This approach however has yet to be agreed or ratified. In the longer term these issues might be resolved when developing countries establish their own legislation and certification authorities. At present most of the interest in establishing certification bodies in the South comes not from governments but from NGOs (FAO, 2001), and the prospect of exporting countries having their own certification systems in place in the near future seems remote.

A further and related issue is that of the technical complexity of the certification process. This can represent particular problems in areas with low literacy rates, where certification forms and other paperwork may be difficult to understand. This problem may be compounded by language and translation issues. One commentator claims that at least ten small organic producer groups in Mexico lost their organic certification in 1999 because of their inability to deal with and process all the relevant paperwork (Boersma, 2000, p.571). The author contended (somewhat rhetorically), that not only do farmers have to be literate to be organic farmers under EU rules but that they also require a computer to keep up with the administration – clearly not a realistic option for most Mexican *campesinos*. The development of locally-managed quality control and inspection systems (discussed above) may significantly reduce this problem.

A further issue of contention is the sensitivity of standards of local situations and practices. Most organic standards have evolved in the industrialised world under specific farming systems and are now being applied to very different farming systems and socio-economic contexts in the South. There is a clear tension here between the desire for flexibility, which

reflects local and traditional practices (as advocated by agroecologists), and the need to maintain standards that are respected in destination markets (the organic approach). Although there is some guardedness between these two approaches, we have not found any concrete examples of substances or practices employed in agroecological systems that would not be permitted in organic ones.

There is a potential for such tensions to arise. The use of indigenous botanical extracts as pest and disease controls provide one possible cause, as some of these are unlikely to be known or tested in the North.[54] Under EU regulations preparations for pest and disease control must be on an approved list (as opposed to fertility-promoting substances, which can be used as long as they are not proscribed (Hardy, pers. comm.)). As the cost and time implications of testing such 'traditional' materials is likely to be high, this may act as a deterrent to the use of traditional, geographically and culturally specific methods of pest and disease control. A second potential source of tension is the planned removal (in 2004) of some non-organic compounds from the approved lists of substances. This includes copper-based substances, which are often used to combat fungal disease. This change is likely to affect producers in the North and the South equally. On the balance of evidence that we have discovered it is difficult to evaluate whether there are real conflicts likely here or whether resistance to standards is rooted in *'agroecologists' aversion to the normative organic approach'* (Caldas, pers. comm.).

A further substantive issue is the question of whether and to what extent standards should include social criteria. At present, organic standards are almost exclusively process-oriented agricultural ones with little or no social content. Thus there is a limited basis for guaranteeing that organic produce is grown under conditions that are (dangers from pesticides and insecticides aside) any less exploitative than some conventional farming systems. This creates something of a dilemma, as there is a widespread acceptance that organic consumers also wish to be ethical consumers and often assume the produce that they buy is 'fair traded'. To a lesser extent the reverse also holds true (Browne et al., 2000). These assumptions are not necessarily correct, and accreditation under both forms of certification can bring significant benefits. The Ambootia Tea Estate found that the premia on fair trade tea made up for losses in yield while they were in the process of conversion to a biodynamic system. Gugal (2000) reports on a fair trade/organic producer co-op in Brazil, growing hot peppers for export and domestic consumption, that yields a 35-40% premia over and above normal market prices. In Nicaragua, small-scale coffee farmers have been assisted to shift to organic/fair trade schemes (and increase their incomes) by the Co-operative League of the United States (CLUSA) (Maxted-Frost, 1997). Yet at present only a limited amount of produce is traded under both labels (see Equal Exchange, 2001; and case studies 5 and 7) and these often involve separate certification procedures, which adds to transaction costs.

For the most part, producers in the South face uncertainty as to the relative benefits of these different accreditation schemes in terms of securing access to markets and adding value to their produce (FAO, 2000). A growing literature is emerging about the possibility of joining the two schemes together, or at least creating links between them (Blowfield, 1999; Browne et al. 2000; Biofach 2001). This is especially relevant for traditional plantation crops such as sugar, tea, coffee and bananas.

At present the organic movement seems to be keener to incorporate social values into its accreditation processes than the fair trade movement is to adopt practices of organic management. Several organic certifiers (e.g.

the Soil Association) already have a policy regarding 'social justice' within their standards, although these are generally not well developed. IFOAM has a chapter on social justice within its present standards,[55] but wishes to strengthen it and make it more specific. IFOAM is in negotiations with the Fairtrade Labelling Organization (FLO) over this issue (Cierpka, 1999; Biofach 2001) and the FAO (2000a) recently held a seminar on integrating the two systems in banana production. This, while generally in favour of developing links between the two approaches, identified some difficulties in doing so successfully. In particular, trade-offs were identified between the 'efficient' development of standards and stakeholder participation and between specificity in standards (which might disadvantage some groups of farmers) and flexibility (which might undermine the credibility of the scheme). Thus while there are intentions of achieving a closer alignment between the two approaches to certification, there are some difficulties in doing so.

A final interesting twist in the discussion about standards concerns the issues of food miles and seasonality. The organic movement has long valued the importance of local and seasonal produce. However these concerns have rarely been codified into standards. With the increase in global organic trading, such values are at the risk of being marginalized (see, Köpke, 2000; Banks and Marsden, 2001), as food travels long distances by fossil fuel-powered transport – producing pollution and contributing to climate change. Questions are now being asked as to whether existing standards can satisfactorily incorporate issues such as 'food miles' and the substitution of domestic and seasonal produce with imports (Geier, 2001). With the growing involvement of large corporations in the organic market and increased competitiveness between certification bodies, it would appear unlikely that issues such as these, which would significantly expand the current legal scope of organic standards, will be universally accepted.[56] What might emerge from this debate is a 'gold' organic standard, which incorporates these broader issues and would be aimed primarily at 'core' organic consumers.[57]

4.7 – Institutional and political issues

Certification issues aside, there are very real institutional and political barriers to the development of OAA. At present, governmental involvement in promoting OAA is quite rare and in most instances motivated by a desire to tap into the earnings potential of export markets. Other potential benefits of OAA, such as increasing food security, village self-reliance, environmental resilience and biodiversity are rarely considered as explicit reasons for its adoption (Scialabba, 1998). Governments in the South are with few exceptions at best indifferent and at worst hostile to the development of organic and agroecological farming systems.[58] Often such approaches run counter to the policy initiatives which they are supporting or financing: initiatives that frequently involve promoting the intensification of agricultural systems, usually through increasing the uptake of fertilizer, pesticide and hybrid seeds. In consequence, the promotion of OAA in the South is almost exclusively led by NGOs and 'ecological entrepreneurs'. In the case of non export-oriented production systems, under-resourcing of research and extension activities often proves a major constraint, as with very few exceptions NGOs have limited financial resources and scientific expertise (Vos and Plowright 2000).

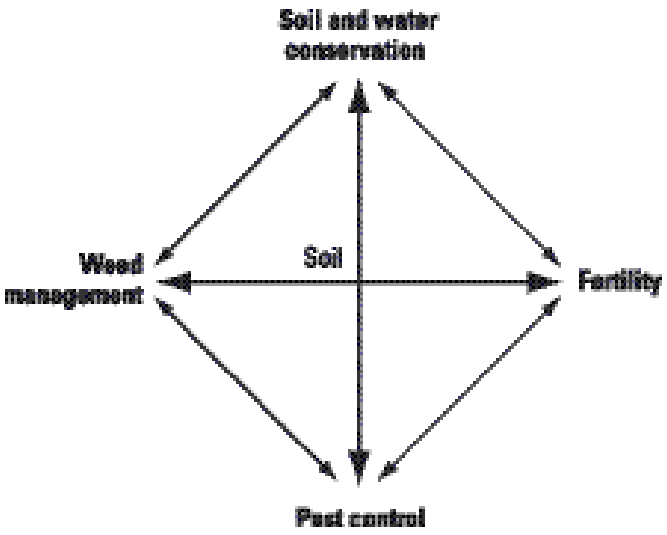
Governments could play a significant role in advancing the cause of OAA within their countries. Areas of activity where governments are arguably better placed than NGOs in promoting OAA include those which involve a more systematic and better resourced (particularly in terms of scientific

expertise) approach to research and extension. Such areas of activity would include:

- Identifying areas where organic and agroecological approaches (including 'de facto' organic farming) are already practised, the effectiveness of existing practices, the depth of the knowledge and the problems experienced.
- Identifying areas where traditional and/or chemical-dependent farming practices no longer provide adequate solutions .
- Developing 'bottom up' capacity (e.g. field schools and demonstration plots) for addressing problems identified in the two items above.
- Reorienting the priorities of state-funded research and educational institutes so as to include topics and issues relevant to OAA.
- Exploration of the possibilities for developing urban composting schemes to develop the potential for producing of food close to population centres.
- Giving consideration to the market potential of OAA in both local and international contexts and in terms of primary and value-added produce.
- Providing support (legal and logistical) to enable the development of organic standards and the capacity for carrying out inspection and certification work domestically.
- Giving fuller consideration of the potential role of livestock (including poultry) aquaculture and agroforestry within existing cropping systems.

One frequently recurring theme within the literature is the need not only for participative research, but also for research which is trans-disciplinary. For example, Vos and Plowright (2000) identify 'a strong need for research that integrates soil fertility and pest management [since] farmers have a basic understanding of pest and soil fertility issues [but] little understanding of interactions [between the two]'. Indeed this call for trans-disciplinary research should arguably be extended to include four key and often inter-related objectives (see table 4.7 below). Rather than pursue these objectives individually, there is often scope for adopting management strategies that produce synergies between them. The importance attached to the these objectives will clearly vary in different circumstances, as will the constraints upon realizing synergies between them .

Table 4.7 – A flow chart for identifying synergies in OAA research.



Growing recognition by international agencies (especially the FAO, and some foreign donors) of the potential for OAA to address a number of inter-related problems may, in the long term, result in governments in the South adopting a more sympathetic and pro-active approach to OAA. It is likely that this will only occur on an incremental basis. On this, the macro-level, there is a need for the organic and agroecological

movements to work together and develop a capacity for 'global advocacy', to publicize the 'how, what and why' of OAA.

However, influencing established institutions may prove to be a long and slow process. The spread of OAA poses threats to vested interests, both financial and professional. Manufacturers and distributors of fertilizers, pesticides, herbicides and hybrid seeds all have a strong financial incentive in maintaining the status quo. Similarly, policy advisers and scientists who have dedicated their professional careers to promoting conventional agricultural 'modernization' are unlikely to be sympathetic to new schools of thought and practice which contradict many of the premises upon which their professional lives have been based. Both these sets of actors, therefore, are likely to raize objections to the advancement of OAA. One of the major tasks facing advocates of OAA will be overcoming the entrenched prejudices which appear to be prevalent in many political, scientific and agricultural communities. However, this barrier is not an insuperable one. The US-based International Fertilizer Development Center (with a branch in Togo) has moved from a very pro-fertilizer stance to one which has a much more balanced approach in favour of mixed organic and inorganic approaches to promoting soil fertility (Toulmin, pers. comm.).

Breaking down these prejudices will not, however, automatically result in a flow of funds for the promotion of OAA. In many countries extension services are poorly funded and motivated (Badejo, 1998) and there is a lack of trained extension workers (FAO, 2000b). The extent of the problem varies between countries. For example, van Elzakker and Tulip (2000) claim that extension services in Tanzania and Uganda are virtually non-existent. By contrast, in neighbouring Kenya reports suggest (see section 3.1) that a combination of government extension services and NGO activities provide a reasonably good advisory service on OAA to farmers. Thus different countries face very different scales of challenge.

Any shift towards promoting OAA has implications for the funding and structures of extension and research facilities. As knowledge about OAA and the resources that it employs are both, almost exclusively, public goods, there is less incentive for the private sector to engage in or support research and extension activities. A shift towards OAA therefore implies a need for greater public funding of these activities. This is not necessarily easily achieved when there are many competing claims on government budgets. Indeed, it is one that is likely only to be justified through providing hard, empirical evidence of the multiple benefits that a shift to OAA can bring.

Yet the spread of OAA is not solely dependent upon financing and training 'armies' of extension workers. Alternative models can and are being employed. In Kenya and India some NGOs train farmers in OAA techniques on the understanding that they will then go and train other farmers in their locality, or use their plot as a demonstration farm (Njoroge 1996; Mariaselvam pers. comm.). This 'snowball' approach has a potential for significantly decreasing the costs of an extension service once a basic structure is in place. Some of the more successful innovations in OAA may need very little institutional support to become accepted. The practice of digging zai (case study 6) has spread across and beyond Burkina Faso, largely via word of mouth – through farmers observing how successful the method is and deciding to emulate it. In China, paddy farmers have spontaneously adopted 'fire break' cropping patterns as a result of seeing their neighbours' successes with a simple and virtually cost-free technique (see case study 8).

A shift to OAA also implies changes in the ways in which 'know–how' is transmitted, with a shift from vertical patterns of knowledge transfer to horizontal ones.[59] This implies involving different actors in the information exchange process and/or equipping them with different skills. In the South there is a particular need for extension workers to be able to combine 'traditional' and 'scientific' forms of knowledge. This is not always an easy balance to strike as 'scientific' and 'folk' knowledge can take very different forms. The latter is highly context dependent. The ability to understand peasant knowledge systems and rationalities can challenge the scientific world view of researchers, who are more accustomed to seeking universally applicable solutions and less attuned to the resource constraints faced by small farmers. Reliance on contrasting forms of knowledge often leads to different approaches to resource management, as Vivan (2000) demonstrates when comparing agroforestry management strategies preferred by agronomists and peasants in Brazil. Approaches to evolving the best of both worlds are discussed in the following section.

4.8 – Social and cultural issues

Knowledge and other resources for developing OAA

This report has identified what are often contradictory reports and interpretations about the cultural and knowledge-based implications of adopting OAA. On the one hand, many accounts extol OAA as fitting closely with the priorities and cultural values of resource-poor farmers. Advocates of OAA argue that these approaches bring social as well as agricultural and environmental benefits. They extend and 'revalorize' traditional knowledge and practices and help strengthen social capacity and community self-confidence. There are many examples of farming communities with sophisticated levels of knowledge and experience in managing complex agroecosystems. The case study of the Chagga is but one example. Upawansa (2000) identifies more than 500 indigenous practices that could inform organic and biodynamic practices in Sri Lanka. Gupta and Patel (1992a & b, 1993a, & b, 1994, 1995, 1996, all cited in Stoll 2000) have written extensively about farmer innovations in Gujarat (India). Norton et al. (1998) describe how the Zuni's sophisticated knowledge of local soil quality in New Mexico enables them to farm in an arid and inhospitable area.

On the other hand, many other reports suggest that lack of information and awareness is the principal barrier to the adoption of OAA. In a survey of African farmers, Harris et al. (1998, p.1) found *'little evidence of knowledge and adoption of improved soil fertility management and crop protection practices of a non-chemical nature'*. Farmers in this survey cited a lack of knowledge of organic management techniques four times more frequently than any other reason as the main reason for their non-adoption of OAA (ibid. p.12). Toulmin (pers. comm.) writes of how fifty years of chemical-dependent cotton growing in Mali have all but destroyed local traditional knowledge.

Paradoxically, very contrasting levels of knowledge can exist almost side by side. Verkerk (1998) writes of visiting two organic farms within three kilometres of each other in Zimbabwe. The first was organic by default and gave the appearance of near-dereliction: aphids were rampant on mature plants, there was clear evidence of nitrogen deficiency, no evidence of organic matter having been applied into the soil or of attempts to control weeds, mulch the soil or provide shade. The vegetables were discoloured and malformed, and would have not been acceptable on local markets. By contrast, a nearby organic farm had healthy plants and a thriving nursery, showed evidence of extensive composting and mulching and of successful pest management.

Similarly, the properties of *Cassia didymobotrya* in treating skin and intestinal problems in animals are well known in western Kenya but unrecognized in central Kenya, where *'it is considered to be just a shrub that smells bad'* (Thijssen, 1995). Thus, knowledge about OAA can vary greatly, even within confined geographic areas. Getachew (1996) confirms this, observing the highly fragmented nature of knowledge about OAA, where different skills are found in scattered localities with little cross-reference or communication between them. Though it may seem a paradoxical suggestion, information and awareness may simultaneously represent the largest single constraint upon, and the most significant resource for, the development of OAA.

How then can we usefully conceptualize, and more importantly assist with the development and transfer of such differing levels of knowledge? Bentley (2000) addresses this problem in a systemic manner, providing a typology of folk knowledge, described in terms of textures. Based on work from the Integrated Pest Management School in Honduras, he proposes four different types of farmers' knowledge, summarized in Table 4.8 (below). Awareness of these can help develop appropriate patterns of information exchange between farmers and extension workers.

Given the contrast between the great stores of knowledge in some areas and the almost complete absence in others, it would appear almost impossible to make bold generalizations about the role of knowledge and information as a resource for, or a constraint upon, the development of OAA. The challenge lies in developing practices and networks that are able to gather and disseminate local information, and

Table 4.8 – Textures of folk knowledge

Knowledge type	Example	Ideal field worker response
Thick: important and easy to observe. Local people may know more about the topic than scientists do. Local knowledge can be empirically verified by scientific methods.	Honduran farmers know more about wasp honey, and how to harvest it, than entomologists do. Farmers also know about non-lethal techniques for controlling bird predation, such as stringing tape from old cassettes, like ribbons, across fields.	Learn from farmers. Validate their knowledge and techniques.
Thin: unimportant, but easy to observe. Local people know about a topic in a way that scientists can understand, but local knowledge is less complete than that of scientists.	Honduran farmers know many predatory insects by folk names, but do not realize that they are beneficial, natural, enemies of herbivorous insects.	After learning local systems, teach people the missing ideas. Add to their folk knowledge.
Empty: unimportant and difficult to observe. Local people know little or nothing about the topic.	Honduran farmers are unaware of the existence of parasitic wasps.	Fill in the gaps in local knowledge, teach them about the existence (and role of) parasitic wasps, etc.
Gritty: important but difficult to observe. Local people have beliefs and perceptions that are at odds with scientific notions. These ideas cannot be verified by scientific methods.	The belief that insect pests are spontaneously generated by the use of insecticides and chemical fertilizer is quite widespread amongst smallholder farmers in Honduras.	Be careful. Avoid contradicting beliefs unless it matters to the programme. Learn the belief and the reasoning behind it, which is often logical but based on incomplete facts. Use local rhetoric to explain he scientific perspective. Teach these ideas with respect.

(Source: Bentley 2000)

supplementing this with knowledge from other areas.

This in turn raises the question of how to promote more context-sensitive forms of research. There are many examples of farmer-oriented research and dissemination activity projects (see for example Stoll, pp 264-366). We noted earlier that participatory farmer research forms a significant sub-discipline in its own right. Some writers question how effectively and whole-heartedly the lessons learnt from such research are being applied within the organic movement. Lockeretz (2000), for example, detects elements of rhetoric in claims *'that organic research is farmer-oriented, holistic, multi-disciplinary and systems-oriented',* believing that organic research methods currently employed are *'not significantly different from conventional agricultural research'.*

Undoubtedly the main issue in this regard is to develop research capacities that can help solve locally-identified problems. Because OAA is so context specific, both ecologically and culturally, there are no uniform solutions. Problem analysis needs to be 'user', rather than 'resource' specific (Scialabba, 1998). This in turn implies a need for participatory, not top down, approaches to research. Sharing and enhancing traditional knowledge in developing countries is of critical importance in organic agriculture (FAO, 1998, p.9). As Altieri (2001, p.1) notes:

'most agroecologists recognize that traditional systems and indigenous knowledge will not yield panaceas for agricultural problems… but the most rewarding aspect of agroecological research has been that by understanding the features of traditional agriculture, such as the ability to bear risk, biological folk taxonomies, the production efficiency of symbiotic crop mixtures, etc., important information on how to develop agricultural technologies best suited to the needs and circumstances of specific peasant groups has been obtained'.

The need to disseminate information about technical aspects of organic farming (e.g. optimal patterns of rotation, varieties to use, optimal planting times, soil fertility and pest management practices) is likely to be most pressing during early periods of conversion. Learning and using farmers' vocabularies for pests, predators or soil characteristics are critical elements of this communication process (Steiner 1998, Meir, 2000). As OAA spreads within a locality this knowledge should become more widespread and part of 'local folklore.' Finding the resources to start communities off on this learning curve is arguably the most problematic issue facing the development of OAA in many parts of the world.

Knowledge is not the only resource that needs to be shared. In an earlier section we discussed the importance of minority and endangered species. Exchange of seeds has long been an important though informal form of networking amongst traditional farmers. In more recent times more formal Seed Exchange Networks (SENs) have been set up, such as PELUM (based in Zambia, and covering South and East Africa) and Navdanya in India. Several of the NGOs who responded to our survey saw this as their most important area of activity, as it maintains and expands the resource base on which locally-specific forms of agriculture depend.

Access to organic inputs can also be problematic. Whilst organic farms should ideally be able to draw on their own resources to maintain soil fertility or control pests, there are clearly occasions when external inputs are needed. For example soil amendments (e.g. rock phosphate) may be needed to rectify nutrient deficiencies. In other cases the process of collecting or preparing botanical treatments for pest infestations may require skills, equipment or labour inputs that individual farmers lack.

There is thus a need to develop marketing and distribution networks through which such inputs can be acquired at reasonable prices. One successful example is the development of a neem seed processing unit in Kenya which provides 'ready-to-use' pest control materials to organic farmers (Förster 2000). In India, when the Maikaal bio-cotton project grew to a critical mass, local traders were influenced to start carrying biodynamic preparations as well as or instead of conventional ones in response to the risk of going out of business (Caldas 2000a).

Employment, land tenure and the domestic division of labour

There is a general consensus that organic systems require a greater labour input than conventional farming, although labour requirements are more evenly spread across the year because of practices such as multi-cropping (Lampkin and Padel, 1994; FAO, 1998b). Recent research goes some way to challenging this view, at least as a universal generalization. Garcia and Brombal (2000) recently analysed labour requirements on conventional and organic farms in Sao Paulo State (Brazil) and found no significant difference in total labour requirements between the two systems, although there were differences in the timing of labour inputs (with the organic system being more evenly spread). The main difference between farm labour requirements was attributable to the different crop types. Equally, data for labour requirements gathered from India and Nicaragua as part of IFOAM's OA '99 Programme (see section 4.1., above), showed no consistent pattern of differences in labour demand between organic and conventional systems (Witte et al., 2000).

Several of the projects and initiatives reviewed in this report suggest that the adoption of organic methods can generate **new employment** opportunities. For example, in Burkina Faso, the digging of Zaï generates new jobs, in Senegal the establishment of an urban composting scheme has had the same effect and in Meru (Kenya) the opportunities created by an organic herb project attracted villagers back from the city. These increases are attributable to increased productivity, improved access to markets or strategies of import substitution and are a result of the improved economic capacity created by the adoption of OAA. Many factors, such as the degree of intensity of the existing farming systems, are likely to play a key role in determining how adopting OAA affects labour demand.

Security of land tenure can significantly influence farmers' willingness to invest either time or money in achieving long term improvements in land fertility. Established land rights (not necessarily the same as ownership) are a prerequisite for developing effective long-term organic management strategies. Issues of equity of land distribution and security of tenure will critically influence farmers' decisions regarding the extent that they are prepared to invest in OAA techniques which may only yield long term benefits (Teshome, 2000). Even where land security is not an issue the physical structure of farms may influence the extent to which farmers are prepared to adopt organic management strategies. In some parts of the world, particularly where radically different ecological and climatic zones exist in close proximity to another, farms may be dispersed across two or more plots of land (e.g. 'home gardens' and bush fields'). Differences in accessibility may well influence farmers' willingness to engage in fertility building techniques. For example, 'bush fields' may be several miles from a farmer's home, raising obstacles to transporting compost.

Domestic divisions of labour can also influence the uptake of organic systems and adopting OAA can, by the same logic, impact on domestic divisions of labour.

Traditionally many agricultural tasks are divided along gender lines. To oversimplify somewhat, men often assume responsibility for cash crops and women for the kitchen gardens which feed the family. Commonly these two different production systems are managed under different regimes, with scarce cash resources used to buy fertilizer for cash crops and de facto organic systems employed on home vegetable gardens.

Given the frequent gender division between these activities, it is argued that women are more likely to be engaged with de facto organic farming and will have a greater affinity with organic approaches (Moali-Grine, 2000; Njai, pers. corr.),[60] and may have pools of knowledge that can more fully be drawn upon. Despite this, some commentators point out that the role of women in organic agriculture is often overlooked, especially by extension services (Kinnon and Bayo, 1989; Kachru, 2000).

Women represent an important potential constituency for extension services, although building effective contact with women organic farmers can sometimes be problematic, especially in societies that are rigidly divided along gender lines. For example, in Zimbabwe women growing organic cotton faced a problem in becoming certified producers, as they traditionally have no land rights. A new mechanism, granting 'Wife's Special Exemption' was created to meet certification requirements. Reliance on freely available local resources assisted these women to enter the cash economy without any initial investment – an extremely significant development in a region where one third of households are headed by women (Page, 2000).

In Kenya, participation in organic farming has created a new status for women, with those participating no longer feeling themselves to be *'just housewives, but family managers who are economically empowered'* (Njoroge 1996, p. 27). In some instances this has led to them taking control of the family farms, hiring labour and even purchasing vehicles to take produce to market.

'Thinking organic'

We earlier argued that much 'de facto' organic farming occurs by default, as resource-poor farmers cannot afford to buy artificial inputs. The question therefore arises of whether farmers, driven solely by economic necessity, will start using artificial inputs if and when their circumstances improve. In other words, will organic management prove to be a short-term palliative that is abandoned for more conventional practices in a few years time?

For many in the organic movement, the exercise is not merely one of increasing the number of certified (or 'de facto') producers' worldwide, but of winning over the hearts and minds of producers (and consumers) to a more 'holistic' and 'inclusive' world view – a world view which seeks to promote ecological and economic self-reliance. One key to this endeavour is that of strengthening social capacity and self-confidence. Many adherents of OAA believe that these approaches can play a key role in the South in helping promote self-reliance and reducing dependency on the 'expertise', technologies and markets of the industrialised world. At the same time OAA can help valorize local and traditional knowledge and practices. As Boersma (2000) notes, *'for native Indians being an organic farmer is also an expression of art and beauty.'*

While such attitudes may be prevalent amongst those groups with an established tradition of organic farming, those who farm conventionally do not necessarily share them. Interviews by Harris et al. (1998, p. 9.) identify some resistance to organic farming because it is perceived as requiring more work. One farmer in Tanzania was reportedly reluctant to go organic as

'collecting and preparing ingredients needed for organic farming is tedious and time consuming.' Another in Ghana expressed similar views, stating that *'the practice of organic farming is tedious to undertake'*. By contrast, one farmer in Senegal was delighted with the benefits that organic farming created. *'Before, I used to spend 4200CFA [about £5.00] on the fertilizer needed to help bring on my crops: with biological farming I spend almost nothing, except for some manure and green compost. I am able to spend that money on other things and it is more than recovered through the sale of biological produce'* (Anon 2000, p.8). Clearly attitudes towards the benefits and drawbacks of organic farming vary as much according to the individual temperaments of farmers as to other factors.

The extent to which adopting OAA helps generate 'alternative' world views, whereby traditional farmers and policy-makers view indigenous knowledge and resources with pride as opposed to shame, is perhaps one of the key criteria in its ability to bring about lasting change. This broader socially transformative role of OAA is often overlooked in discussions about its potential. It is nonetheless one that resonates strongly with the development agenda in its widest sense. It is therefore in some respects paradoxical that one of the main driving forces for the adoption of OAA in the South remains the prospect of a greater engagement with markets in the North.

5 – Conclusions and recommendations

5.1 – Creating a coherent 'alternative' agricultural movement

The evidence in this report suggests that there is a rapidly growing interest in the South in the potential of OAA as a means for achieving a number of objectives. These include:

- increasing farmers' incomes
- increasing yields and productivity in traditional, marginal, agricultural systems
- improving soil fertility and long term sustainability of farming systems
- reducing farmers' dependency on artificial inputs and the exposure of rural populations and environments to their side effects
- assisting with the restoration of degraded or abandoned land
- maintaining and improving biodiversity
- promoting and valorizing local knowledge and building self confidence.

Knowledge of the extent to which OAA is practised in the South is far from complete. Official data relating to land under certified organic management suggests that organic farming is still very much a minority activity. Only one country in the South (Argentina) has more than 1% of its agricultural land under organic management. While such data may be incomplete, there is a far bigger gap in our knowledge of the extent to which de facto organic and agroecological systems are employed throughout the world. Evidence suggests that these two latter approaches are much more widely practised than the formal organic approach, although there is no reliable means of estimating by how much.

Reasons for adopting these different approaches vary significantly. Formal organic approaches to farming are generally adopted to gain access to and/or competitive advantage in export markets. Where governments are involved in promoting organic farming it is generally with the aim of boosting agricultural export earnings. Other actors, however, are promoting OAA for very different reasons. A range of rural development and environmental agencies and NGOs are beginning to use OAA as a tool to meet a range of broader developmental and environmental objectives. The emphasis of different programmes and projects may vary, but there is evidence that they often yield multiple benefits. At the same time farmers in many developing countries are withdrawing, either partially or completely, from the 'agrochemical treadmill'. Thus there is a clear convergence of interest between the agendas of different agencies and many farming communities. Such a convergence could lead to a widespread uptake of OAA in what might prove to be a truly green 'Green Revolution'. In our opinion the potential of these individual approaches and the synergies between them has yet to be fully explored.

Because the issues and agencies driving the uptake of OAA are many and diffuse, information regarding the incidence and successes of OAA, and the constraints it faces, is spread across many different sources. Differing approaches to OAA, (e.g. certified organic, agroecology, agroforestry, and 'de facto' organic practices adopted in rural/participatory development programmes) mean that there are many professional groupings who have knowledge and experience of the issues, but who do not necessarily share these resources or experiences with colleagues in other fields.

Rist (2000) identifies that the lack of co-ordination and communication between different disciplinary approaches (such as agriculture, livestock production, forestry, agroforestry, research, education and agricultural extension) provides a major

obstacle to developing more robust forms of OAA and in communicating the benefits of OAA to a broader audience. Greater cross-disciplinary and cross-professional communication would significantly enhance the comprehensiveness of current knowledge of the benefits and potential of OAA. Whilst this may be difficult to achieve on a global basis, it may be possible to create linkages between different professional groupings on local, regional and, sometimes a national scale. This would be a valuable first step towards creating a more unified and coherent 'alternative' agricultural community, one which shares broadly similar values but has yet to learn to work together in the pursuit of common goals – something which would enable it to share experiences and present a more unified front to the world at large.

5.2 – Promoting OAA: defining objectives

A central objective of this report was to identify mechanisms through which relevant funding and advocacy bodies might best engage with promoting the development of OAA. We believe that there are two main avenues through which such efforts could be channelled: through global advocacy and supporting grassroots initiatives. Each approach has its attractions and drawbacks (see Schoones and Toulmin, 1999, in chapter 7 for a general discussion of these issues). Before discussing these approaches in any detail we raise a number of questions (below) regarding organizational capacity and priorities – questions that we feel will help organizations clarify the issues and choices involved in selecting the most appropriate approach (or combination of approaches).

- Which geographic areas can we most effectively work in?

- How can we most effectively work (e.g. direct involvement in research and projects or financing and contracting others to do so)?

- Which areas of work do we wish/feel best able to support (e.g. pure and/or participative research, promoting knowledge transfer, supporting training and extension programmes, assisting with the development of mechanisms for inspection and certification, or education and advocacy)?

- What criteria will guide our choice of involvement (e.g. promotion of conservation interests promoting food security, restoring degraded land, promotion of specific OAA techniques)?

- Do we have the capacity to build direct links with grass-roots organizations in the South, or would we rather work with 'first world' institutions with proven expertise and existing links?

- Do we wish to work in areas where OAA has established itself and where there is a baseline of local expertise and institutional capacity, or to develop seed-corn projects in regions where OAA has yet to achieve a critical mass?

Such questions are best answered by organizations themselves in view of their aims, objectives and capacities – we do not presume to advise on such issues. What follows is a discussion of two broad approaches to promoting OAA, those of advocacy and building local capacity, which might be pursued in isolation or combination.

5.3 – Global research and advocacy

In this report we have identified a range of projects and initiatives that illustrate the benefits and potential of OAA in a range of different ecological, agricultural and socio-economic contexts. We have identified a number of ways in which these methods and approaches can address a range of problems facing farmers, rural (and sometimes urban) communities and policy-makers in the South. Yet we are acutely aware that the desk-based

nature and relatively short time span of this study have limited its scope and comprehensiveness. We are also aware that the report raises more questions than it can answer. We feel that further research in this area has potential in at least three respects, outlined below.

Firstly, we believe that such research and advocacy has value in informing the debate about global food security, sustainability and the relationship between the two. One of the main constraints on the development of OAA appears to be the attitudes of governments and other policy makers – who are often indifferent, and occasionally hostile, to OAA. The FAO notes that there is a 'widespread belief among many sections of society that organic agriculture is not a feasible option for improving food security' (1998, p.12). This it argues is a major constraint upon gaining greater support for OAA. The growing recognition afforded to OAA by international agencies (such as the FAO and UNCTAD) and foreign donors may well result in governments in the South adopting more sympathetic and pro-active approaches to OAA. The organic and agroecological movements could help accelerate this process through building up and maintaining a capacity for 'global advocacy': publicizing the 'how, what and why' of OAA. The task of promoting diverse and self-reliant systems of food production becomes ever more urgent given the dominant trends of centralization and commodification within food production systems and the vested interests which promote these processes.

Research of this nature is also of considerable potential interest to practitioners in the field. As we noted earlier, one of the paradoxes surrounding OAA is the variation in the levels of knowledge available to different communities. Gathering (and disseminating) information about best practice is one crucial way of improving the knowledge base within knowledge-poor areas.

Such research would also be of potential interest to the academic community, as it resonates with a number of key current concerns within the social sciences including:

- How communities and decision-makers in the South evaluate and implement competing models of 'traditionalism', 'ecological modernization' and the (GM-led) 'second Green Revolution'

- How different 'quality conventions' are negotiated and implemented along food supply chains and how these affect access to, and competitiveness within, markets

- The relevance and effectiveness of 'oppositional' strategies to globalization and commodification, particularly in relation to issues of agrobiodiversity.

In relation to the issues discussed in this report, two potential research areas emerge that may prove of interest to the rural development research community:

- The existing common ground, tensions (and potential for resolving these) between the organic, agroecological and sustainable approaches to agriculture and specifically, how these are played out on the ground in project development and prioritization

- Whether and how OAA can develop as a 'paradigm of innovation' which can build an effective strategy of research and development capable of widely diffusing best practice while absorbing new lessons from those areas where it is being adopted.

5.4 – Building local capacity

As well as developing a capacity for global advocacy, there is clear need for further support in developing local abilities to implement OAA techniques and systems. Two different approaches might be adopted which help to build such capacity. The first involves working with established Northern-based agencies

(consultancies, NGOs etc.) who have experience and links in the South. The second involves working directly with grassroots NGOs in the South.

This study identifies a number of agencies with a proven track record in researching, developing and disseminating information regarding organic and agroecological practices. Individually and collectively they have a wealth of experience in developing programmes for research and development, training, extension and marketing. A number of these organizations are identified in Appendix 2a. They include research institutes, international NGOs, and private sector consultancies. Most of these agencies are dependent on external funding (from either the commercial or public sectors) to carry out their work. Inevitably in their work, they will have identified projects, schemes and initiatives which they feel merit further investigation and/or development for which they may have been unable to attract funding. Thus they are well placed to advise on specific projects with development potential as well as those that have a potential for transferability. Organizations with little prior experience in this area are likely to find that institutions such as these are well placed to identify, develop and execute projects and programmes.

A second option available to organizations wishing to involve themselves in this area is that of building direct contact with NGOs in the South. This is clearly the most attractive option in terms of providing value for money and producing direct benefits on the ground. Yet it is also a relatively high-risk strategy, as it involves identifying and selecting groups who have the administrative capacity to manage funds and to monitor and evaluate project performance. Some governmental developmental agencies and many development charities work on this basis (although more often they have local field staff overseeing projects). The projects that they finance may include those with a significant OAA component but are rarely solely, or even primarily, geared towards these types of project.

Two private charities (SARD and the Amber Foundation) are primarily oriented towards supporting NGOs and producer groups involved in OAA. SARD have established an annual prize, worth $10,000 and normally split between three winners every year. Thus they simultaneously lend financial support to grassroots NGOs and also publicize and celebrate the successes and achievements of NGOs in providing workable, sustainable solutions.

Throughout this project we identified a number of grassroots organizations often in need of funding to develop projects and research initiatives. Most frequently the concerns of these groups fell into one of three areas:

- Developing educational/training/extension and marketing facilities to support farmers wishing to convert to organic and agroecological methods of production

- Developing certification programmes so as to put OAA on a formalized basis in order to maintain standards markets, the credibility of organic produce in domestic markets and enable participation in export markets

- Building up infrastructure to permit organic and agroecological producers to add value to and more effectively store or market their produce.

Some NGOs and producer groups who replied to the survey took the opportunity to send detailed (and sometimes costed) project proposals (although we assume that they were not drawn up solely in response to our request for information). More commonly, these organizations discussed plans and aspirations and the problems of accessing funds to develop their capacity as effective ambassadors for OAA. Appendix 2b contains summary details

of, and contacts for, NGOs responding to our survey. Inclusion within this list does not imply any seal of approval of the organizations on behalf of the authors (nor does omission from it imply disapproval). Rather the list provides an overview of NGO activities.
This information might be used to identify direct opportunities for supporting grassroots organizations or, more generally, to identify the priorities of such groups with a view to developing programmes that effectively address issues of prime concern.

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Glossary of Abbreviations and Acronyms

ABLH
Association for Better Land Husbandry

ACAO
The Cuban Association for Organic Agriculture

AGRUCO
Agroecologiciá Universidad Cochabamba (Bolivia)

APPRI
Association for the Promotion of Intensive Rotational Grazing (Argentina)

BBP
Better Banana Project

BD
Biodynamic

CIESA
Centre for Investigation and Teaching on Sustainable Agriculture (Argentina)

COAE
Centre for Organic Agriculture in Egypt

DfID
Department for International Development

ECOA
Egyptian Centre of Organic Agriculture

ESRC
Economic and Social Research Council

EU
European Union

FAO
Food and Agricultural Organisation (United Nations)

FLO
Fairtrade Labelling Organisation

GET
Greenpeace Environmental Trust

GM / GMO
Genetically Modified / Organisms

GOAN
Ghanaian Organic Agriculture Network

GTZ
Deutsche Gesellschaft für Technische Zusammenarbeit – (The Germany Agency for Technical Co-operation).

HDRA
Henry Doubleday Research Institute

ICIPE
International Centre for Insect Physiology and Ecology

ICRAF
International Centre for Research in Agroforestry (Kenya)

IFOAM
International Federation of Organic Agricultural Movements

IIED
International Institute for the Environment and Development

ILEIA
Information Centre for Low-External-Input and Sustainable Agriculture (The Netherlands)

ITDG
Intermediate Technology Development Group

LEISA
Low External Input and Sustainable Agriculture

SRI

System of Rice Intensification (Madagascar)

ISD
Institute for Sustainable Development (Tigray)

ITC
International Trade Centre (Switzerland)

KIO
Kenyan Institute of Organic Farming

MAPO
Moviemiento Argentino para la Produccion Organic

NGO(s)
Non Governmental Organisation(s)

OAA
Organic and Agroecological Approaches

OFDC
Organic Food Development Centre (China)

SARD
Sustainable Agriculture and Rural Development Prize.

SÖL
Stiftung Ökologie and Landbau

TAB
Tigray Agricultural Bureau

UCIRI
Union of Indigenous Communities of the Isthmus Region (Mexico)

UNCTAD
United Nations Centre for Trade and Development

UNDP
United Nations Development Programme

USDA
United States Department of Agriculture

WHO
World Health Organisation

WFDFFM
World Food Day Farmers' and Fishermen's Movement

WWF
World Wide Fund for Nature

Appendix 1 –
Electronic resources for OAA

Agexpront
Guatemalan base export business.
http://www.agexpront.com/ingles.htm

Agro Eco Consultancy
Dutch based agroecological consultancy who have experience in Africa, Latin America and Asia. They have involvement in Forestry and the EPOPA programme (Export Promotion of Organic Products from Africa) financed by the Swedish government agency, SIDA. They have also contributed a chapter on evaluating organic projects for a DfID handbook and have published material on developing organic cotton systems. They have branch or associated offices in Argentina, Uganda and Zimbabwe and have worked in partnership with many overseas NGOs. *http://www.agroeco.nl/agroeco*

Assoc. de Organisaciones de Productores Ecologicós de Bolivia
Bolivian organic producers association. Site lists 41 members (producers and consultants) and details of their publications, technical services and forthcoming events.
http://www.megalink.com/aopeb/

Bioherb
German based consultancy working mostly in tropical countries supporting producers and processors of organic, medicinal and aromatic plants. They currently are involved in projects in China. Madagascar and Bolivia. Other countries in which they have experience include Nepal, Sri Lanka, Kazakhstan, Tanzania, Peru and Malawi. Their site also contains a directory of third world organisations involved on organic production and marketing.
http://www.bioherb.de

Boweevil
Associated with the good food foundation
Bo weevil (named after the Cotton Boll Weevil) works with cotton producers in the South. This site also explains the problems of conventional cotton production and is well illustrated.
http://www.boweevil.nl/english/bw_frames.htm

CAB International
This site, launched by CAB International (and funded by MAFF) in October 2000, provides news, details of research, training and job opportunities. It is mostly focused on Europe and North America, but plans are afoot to launch an internet based searchable database covering research in Spring 2001. Subscription based but offers a free trail.
http://www.organic-research.com

Centro Interdisciplinario de Estudios Sobre el Desarrollo,Uruguay (CIEDUR)
Uruguayan NGO with a specific focus on sustainable development.
http://fp.chasque.net:8081/ciedur/presentation.html

Chaoda Modern Agricultural Holdings Ltd. (China)
Home page for Chinese production and distribution company. Their mission is 'to promote hi technology biological farming and within ten years become the flagship of China's agriculture strategy and to rank among the 500 largest enterprises in the world'. They presently have c.1,000 Ha. of land in agricultural production, in 7 provinces , but mostly concentrated in
Fujian and Jiangsu provinces. They plan trebling this figure by 2002 on the basis of land already in conversion. Their also provides links to over 30 Chinese companies and agencies (presumably with an interest in organic production). *http://www.chaoda.com/*

City Farmers
Web page from Canada's Office of Urban Agriculture. Has links to Urban farming news / sites in the third world.
http://www.cityfarmer.org/

Daabon Organic
Colombian organic traders and certifiers. (English language) *http://www.daabon.com.co/*

Eldis
Gateway to many development organisations and topics. *http://nt1.ids.ac.uk/eldis/eldsea.htm*

Egyptian Centre of Organic Agriculture
Egypt's accreditation organisation for organic farms and processors. Little Information here.
http://www.ecoa.com.eg/

Equal Exchange
US based 'fair trade' organisation, which focuses on organic and 'shade grown' coffee. Interesting information about coffee growing process and details of their projects / partners organisations in Latin America, Tanzania, India and Indonesia. *http://www.equalexchange.com*

European Universities' Consortium for a Common Curriculum in Ecological Agriculture
Provides links to Universities in the EU who provide organic and agroecological courses and do research in the field .
http://www.irs.aber.ac.uk/research/Organics/training/consort.html

Food and Agricultural Organisation
The FAO is the largest autonomous organisation within the United Nations. Its mandate is to raise levels of nutrition and standards of living, improve agricultural productivity, and better the condition of rural populations. In 1999 the FAO Committee on Agriculture (COAG) approved FAO involvement in organic agriculture. Undoubtedly FAO's support for organic agriculture will give added legitimacy and weight to the organic movement. Already its web pages on Organic agriculture some of the most comprehensive to be found on the internet and include a facility to search on line for bibliographic resources.
http://www.fao.org/organicag/
Other FAO sites worth visiting are:
The David Lubin Memorial Library
http://www.fao.org/library/dlubin/DlsitesE.htm
and WACIENT (World Agricultural Information Centre)
http://www.fao.org/waicent/search/default.htm

GaMa
Brazilian importers and exporters, specialising in Soya products. *http://www.gama.com.br/*

Global Agricultural Information Network (GAIN)
This site is a subsidiary site the ES Federal Agricultural Service (FAS). It mostly provides links to reports of relevance for export of US agricultural produce. It has some useful market intelligence on organic production in demand in some developing countries.
Use the subject search 'Organic. '
http://www.fas.usda.gov/info/factsheets/reports.html

Good Food Foundation
Dutch based co-operative project for promoting organic production in the third world. Members are mostly food traders who work to secure supplies to meet domestic demand. They mostly work in Turkey, but have other projects in Sri Lanka and China. Their site also gives links to a wide range of other organic organisations. *http://www.goodfood.nl*

GreenAqua
Ecuadorian based organic aquaculture company *http://www.greenaqua.com*

Green Foundation
Site of an Indian based (Tamil Nadu) NGO who work closely with small and marginal farmers in the dry-land regions of South India. Their main focus is on seed conservation / exchanges., promoting agri-biodiversity, traditional knowledge systems and organic farming practices. *http://www.greenconserve.com*

Green Trade Net
German based site providing a showcase for organic products. It includes details of reports covering 18 of the most important tropical imports. *http://www.green-tradenet.de*

Grolink
Swedish based consultancy primarily aimed at promoting organic agriculture, developing certification schemes. They also provide training courses for those wishing to develop their experience in promoting organic systems in the third world. Much, but not all of their work is marketing oriented. Site also contains a list of publications and details of their training programmes. *www.grolink.se*

Henry Doubleday Research Association
An organic gardening research group based in England. It is involved in the preservation of endangered vegetables and fruit species. They are extensively involved in organic research in the UK and abroad, where they also offer a tropical advisory service, which has provided information and advice since 1992 on tropical organic agriculture to individuals and organisations in the tropics and sub-tropics. The aim is to give small-scale, farmers the knowledge and skills to enable them to improve existing farming systems, increase food security, increase safe food production and contribute towards environmental protection. It runs a tree seed distribution programme, supports a seed saving programme and has helped establish the Ghanaian Organic Agricultural Network

Overseas Research includes:

- Organic agriculture in sub-Saharan Africa: farmer demand and potential for development
- Manure management in Kenya
- The use of urban waste in peri-urban agricultural systems
- Optimisation of neem products: value to poor farmers and constraints to development
- Prosopis juliflora and related arboreal species: a monograph, extension manual and database
- Ethical trading: definition, practice and possible links with organic agriculture
- Assessment of the needs of Cuban urban agriculture
- Composting workshops in Palestine

http://www.hdra.org.uk/

Hess Naturtextilien
German based organisation trading in organically produced textiles (German language only) *http://www.hess-natur.com*

Incatops
Peruvian based and IFOAM registered manufacturer of Alpaca tops.
www.incatops.com

Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA)
Established in 1982 with Dutch government funding, ILIEIA is now an independent organisation. Its is to promote Low External Input and Sustainable Agriculture (LEISA), through

- Collecting and exchanging information
- Facilitating Farmer Guided Research to assess the viability of LEISA production systems and
- Contributing to the political debate on sustainable agriculture.

It has a library / documentation service on ecologically-oriented agriculture, with around 7000 documents. (Which can be searched remotely at *http://www.bib.wau.nl/ileia/*). It publishes
a quarterly newsletter in English and Spanish which is distributed free to institutions and individuals in the third world.

ILEIA has recently reviewed of its activities reviewed its activities and intends to strengthen its links with filed level development workers, while at the same time developing stronger communication links with staff in academic and research institutions and policy makers. Field workers will however remain its core, target audience. To develop this new programme
it is presently looking find a new donors to contribute to an anticipated $2M p.a. budget requirement. *http://www.oneworld.org/ileia/*

Institute for Development Studies
Based at the University of Sussex, the British Library for Development Studies at ISD claims to have the largest Library in Europe on development issues.
http://www.ids.ac.uk/blds/index.html. A search on the keywords 'organics' or 'agroecology' yielded 45+ hits, but very few more recent than 1997.

Institute for Organic Agriculture, Bonn
Mostly European focused research institute –although has scientific research projects ongoing in the South, mostly in Latin America.
http://www.uni-bonn.de/iol/english.htm

Instituto Biodinamico
Brazilian Biodynamic Organisation. Have 60 staff provide advice and consultation and run their own certification scheme. They report having 230 producer (groups) across South America, covering 62,000 ha. *www.ibd.com.br*

International Centre for Research into Agroforestry (ICRAF), Nairobi
The International Centre for Research in Agroforestry (ICRAF), established in Nairobi in 1977, is an autonomous, non-profit research body supported by the Consultative Group on International Agricultural Research. ICRAF aims to improve human welfare by alleviating poverty, improving food and nutritional security, and enhancing environmental resilience in the tropics. ICRAF conducts strategic and applied research, in partnership with national agricultural research systems, for more sustainable and productive land use. It has five research and development themes: diversification and intensification of land use through domestication of agroforestry trees; soil fertility replenishment in nutrient-depleted lands with agroforestry and other nutrient inputs; socio-economic and policy research to allow policies that will benefit smallholder farmers; acceleration of impact on farm by ensuring that research results
are used; and capacity and institutional strengthening through training and the dissemination of information.
http://www.icraf.cgiar.org

International Development Research Centre

Canada's development agency – has a good series of thumbnail sketches of projects 'adventures in development', including organic and sustainable agricultural approaches. *http://www.idrc.ca/index_e.html*

International Federation of Organic Agricultural Movements (IFOAM)
Represents the world-wide movement for organic agriculture. It has more than 730 member organisations in more than 100 countries. It publishes the global basic organic standards, and has been influential in the negotiations with the WTO / WHO codex alimentarius committee. It also promotes annual trade fairs and bi-annual conferences, publishes a world-wide directory of member organisations, proceedings of its conferences and a quarterly magazine 'Ecology and Farming' *http://www.ifoam.org*

International Food Policy Research Institute (IFPRI)
IFPRIs Research focuses on economic growth and poverty alleviation in low-income countries, improvement of the well-being of poor people, and sound management of the natural resource base that supports agriculture. Though they have little specifically focused on organic farming or agroecology agriculture, they have a strong research profile in relevant fields. *http://www.ifpri.org*

International Institute for Environment and Development (IIED)
UK based charitable body with impressive track record of instigating research and project on a range of issues relating to sustainable development in the third world. Their current research projects include a multi country study on 'Policies that work Sustainable Agriculture and Regenerated Rural Economies'. Their current publications list relating to agriculture contains a number of studies of soil fertility and sustainable
land use issues, particularly in Africa, often undertaken from a participative, bottom up perspective (in Tigray, Benin, Malawi and Kenya). *http://www.iied.org/index.htm*

International Rice Research Institute (The Philippines)
Not an organic organisation, indeed they do much work on promoting GM variants. However their Sustainable Agricultural development Programme did win the SARD Prize, reflecting the value of work that they do in this field.
http://www.cgiar.org/irri/pa/index.htm

Isic Tarim Ürünleri AS
Organically certified Turkish fruit packing company. *http://www.isiktarim.com*

Louis Bolk Institute
Dutch based research institute with interests in organic food, agriculture and anthroposophical medicine. Most of the site is in Dutch but their last two annual reports are available in English *http://www.louisbolk.nl/about/index.htm*

Naturland,
German association promoting organic agriculture. Involved in certifying, inspection and advocating organic agriculture. Naturland have strong links with many third world countries. *www.naturland.de*

Organic Cotton Site
This site dedicates itself to 'all the farmers, manufacturers, activists, retailers and others who are devoting their energies to making organic cotton a viable agricultural and economic alternative'. Links range from details about pests and pesticide use to the design and fashion end of the supply chain. It is Californian based. It has details of the BASIC (Biological Agricultural Systems in Cotton) programme designed to move farmers from chemically intensive to organic systems, a system which may be transferable / applicable in other situations.
http://www.sustainablecotton.org/

Organic Crop Improvement Association
US based association, the world's largest organic certification agency. They have chapters in Latin America and claim (in IFOAM Directory) to have an interest in third world organic production. It is difficult to find much evidence of this on these web pages however.
www.ocia.org

Organic Farm and Garden Supplies
Commercial site for South African based supplier of organic activators, water treatment systems and feed supplements for animals (TM: Penac).
http://www.organicsa.co.za

Organic Standards
On line journal maintained by Grolink dedicated to discussing issues surrounding organic standards *www.organicstandard.com*

Phalad Agro Research Foundation
Commercial site for an Indian producer of organic fertilisers and nutrients.
www.phaladaagro.com

Planeta Verde
Multilingual site of a Brazilian organic brown sugar producer.
http://www.planetaverde.com.br/

Pusat Pendidkan Lingkungan Hiduup
Network of Indonesian environmental education centres, which includes amongst its programmes the promotion of organic farming.
http://www.webcom.com/pplh

Priya Chemicals
Commercial web site for company manufacturing and exporting amino acid based bio-stimulants for agricultural and veterinarian purposes. *http://www.priyachem.com*

Rapunzel (Germany).
Mostly German language site from commercial suppliers *www.rapunzel.de*

Rapunzel (Turkey)
Commercial site for group claiming to be Turkey's longest established and leading organic product development company.
http://abone.superonline.com/~rapmaster/

Research Institute of Organic Agriculture (FiBL),
Swiss based consultancy who are extensively involved in agricultural research, certification and marketing. They have strong links with the Swiss development agency who finance many projects on which FiBL are engaged.
http://www.fibl.ch/engl.html

Resource Efficient Agricultural Production (REAP) (Canada)
An independent, non-profit organisation that has been working since 1986 with farmers, scientists, NGOs and industry, to advance the development of sustainable farming systems. They work with rural communities, both domestically and internationally, to promote environmentally sound development to address society's need for food, fuel and fibre.
http://www.reap.ca

R.I.O IMPULS
Swiss based (and German language only) forum for economics and ecology. Contains some information about organic cotton / textile projects. *http://www.rio.ch*

Rodale Institute
US based Foundation, set up in 1940s and originally called the soil and health foundation. Focuses on promoting organic agriculture and consumption. It places an emphasis on education and has a number
of projects in the South, including Guatemala and Senegal. The Institute was recently awarded a national prize by the President of Senegal for its work with a with a local women's group on the regeneration of community waste management through composting. *www.rodaleinstitute.org*

Sekem
A cultural and social project, based upon biodynamic farming. They now cultivate more than 2000ha, including significant amounts of organic cotton. They have both economic and cultural influence within
Egypt and are well thought within the organic movement as an example of sustainable development. *http://www.sekem.com*

Skal
Dutch based inspection and certification organisation. *http://www.skal.com*

Spice Board, India
The site contains much of interests about the importance and history of spices in general and includes details of the recent developments in organic spice growing, the certification initiatives and lists of growers and exporters. *http://www.indianspices.com/html/s0650org.htm*

Stiftung Ökologie and Landbau (SÖL)
(Foundation for Ecology and Agriculture)
A charity founded in 1961 and initially active in the education and health. It has worked specifically on organic agriculture since 1975. It supports numerous projects and studies related to organic agriculture.
An important aim is the effective dissemination of the knowledge gained. Many of SÖL's activities relate to information about / for organic farming. Their publications include a global database about organic farming and the German language "Ökologie *de facto* Landbau"
a quarterly journal, which covers all aspects of ecology and farming. *http://www.soel.de*

Sustainable Agriculture and Rural Development Prize
A privately funded prize (guaranteed for ten years at a level of US$ 10,000) rewarding land stewardship with impact on the life of rural poor. *http://www.sard-mallinckrodt.de/index.shtml*

Sustainable Agriculture Network /Research and Education (SAN / SARE)
US based network with few foreign links, but some projects possibly of interest *http://www.sare.org*

Tropical Research Institute
Dutch based Institute specialising in promoting international co-operation and intercultural communication. It has some experience in supporting agroecological projects and an extensive library. *http://www.kit.nl*

United Nature
German based organic trading company *http://www.unitednature.net*

Appendix 2A
Research Institutes and Consultancies

This listing, which is by no means exhaustive, details contacts for research institutes, development agencies and consultancies. It is mostly drawn from responses to survey work and articles written by staff members. These organisations have an international focus and, for ease of reference are listed under their home countries. Fuller details of their activities or research expertise can either be found in the main body of the text or in Appendix 1.

Canada
City Farmers. Experience in urban farming projects in the first and third world. Contact via web pages *http://www.cityfarmer.org*

Resource Efficient Agricultural Production. Sustainable agriculture NGO. Contact via web site.. *http://www.reap.ca*

Chile
Movimento Agroecologico en America Latina y El Caribe. Pan Latin American OAA network. Mario Ahumada *maa@ctcreuna.cl*

Germany
Bioherb: Consulting for Organic Agriculture. Ulrich Helberg, *bioherb@t-online.de*
Fair Trade Labelling Organisation. International co-ordinator for fairtrade labelling. Carol Doyle *coordination@fairTrade.net*
Institute for Organic Agriculture, Bonn. Contact via web site *http://www.uni-bonn.de/iol/english.htm*
International Federation of Organic Agricultural Movements (IFOAM). Contact via web site *http://www.ifoam.org*

Italy
Food and Agricultural Organisation. Nadia Scialabba, Environment Officer *Nadia.Scialabba@fao.org*

Kenya
International Centre for Insect Physiology and Ecology (ICIPE). Dr. Hans Herren, Director General *hherren@icipe.org*
International Research Centre into Agroforestry (ICRAF) Contact via *http://www.icraf.cgiar.org/*

Malaysia
HUMUS Consultancy and Marketing. Has a good knowledge of the organics sector in S.E. Asia. Ong Kung Wai, , *kungwai@tm.net.my*

The Netherlands
Agro Eco Consultancy. See entry under resources. Bo van Elzakker *office@agoeco.nl*
Bo-Weevil. Marck van Esch *boweevil@xs4all.nl*
Good Food Foundation. Jan Schrijver *info@goodfood.nl*
Information Centre for Low-External-Input and Sustainable Agriculture (ILEIA) Contact via web site . *http://www.oneworld.org/ileia/bridges.htm*

Sweden
Grolink. Gunnar Rundgren, *info@grolink.se*

Switzerland
Research Institute of Organic Agriculture (FiBL). Swiss based consultancy with extensive involvement in development projects. Contact via web site *http://www.fibl.ch/engl.html*

United Kingdom
Ecotropic. UK based biodynamic consultancy with extensive experience, including assisting in conversion of two case studies described in this project: Ambootia Tea Estate and the Maikall Cotton project. Tadeu Caldas, *tcaldas_ecotropic@compuserve.com*
Henry Doubleday Research Association. See resources for details. Contact *enquiry@hdra.org.uk*
IACR Rothamstead. Prof. John Pickett *john.Pickett@bbsrc.as.uk*

International Institute for Environment and Development. contact via web site *http://www.iied.org/index.htm*
Twin Trading a Fair trade group who also

promote organic produce. Alex Holmes *info@twin.org.uk*

United States
Equal Exchange. Fairtrade organisation with several organic projects. J. Rosenthal jrosenthal@equalexchange.com *www.equalexchange.com*
Rodale Institute. Involved in projects, primarily in Senegal. See resources and section on Senegal for details. Contact Amadou Dipo *adiop@rodaleinst.org* or *info@rodaleinst*

Appendix 2B – NGOs and producer groups

This listing, which is by no means exhaustive, details contacts for NGOs and Producer Groups whose activity is mostly within their own countries. It is mostly drawn from responses to survey work and articles written by staff members.
Description of the work of these groups is generally included within the main text of the report or in Appendix 1. Only where these details are not included in earlier sections is a description of the groups activities included. Inclusion or exclusion of groups on this list does not constitute a value judgement on the authors behalf as to their 'worthiness'

Africa

Burkina Faso
Raw Bio Process – producer group also covering Niger and Mali. Contact *rawbio@cenatrim.bf*

Egypt
Centre for Organic Agriculture in Egypt (COAE). Helmy Abouleish *sekem@sekem.com*
Egyptian Centre of Organic Agriculture. Y.A. Hamadi *ecoa@soficom.com.rg*
Egyptian Centre of Organic Agriculture Society. Ahmed El-Araby *elaraby@asunet.shams.eun.eg*

Ghana
Ghanaian Organic Agricultural Network (GOAN). Emmanuel Antwi *goan@ighmail.com*

Kenya
Association for Better Land Husbandry. Promotes organic and sustainable farming in Kenya on a 'near-nil investment' basis. Receive some support from DfID. They are also developing a certification programme for Kenya and promote OAA. Jim Cheatle PO Box 39042 Nairobi. *jcheatle@net2000ke.com*

Green Farming Group. Small community farming group with a 16ha. demonstration farm in Othaya. They are mostly involved

in teaching farmers about composting and water conservation techniques. John Kanyi, Green Farming Group, P.O. Box 897, Othaya, KENYA.
Hope Community Development Programme (Misikhu) A training organisation based in western Kenya involving >1000 farmers, with four extension workers. They have recently set up a small sunflower oil processing unit for local farmers (with aid from ICCO, a Dutch funding organisation). Contact Richard Soita. *Hope@africaonline.co.ke*
Itemeini Organic Farming Self Help Group. Waikwa Stephen Wachira *ifl@africaonline.co.ke*
Kenyan Institute for Organic Farming (KIOF). See text for details. Dr. John Wanjau Njoroge, Director *kiof@elci.gn.apc.org*

Madagascar
Association Tefy Saina Principle movers behind the development of intensive rice growing techniques in Madagascar. Sébastian Rafaralahy. *tefysaina@simicro.mg* PROMABI. Jean Claude Ratsimivony *homeo@dts.mg*

Malawi
Lipangwe Organic Manure Demonstration Farm, Lomadef. The only agroecological demonstration farm in Malawi. Have a membership of 1000+ members who come for on farm training. Other Malawi based NGOs send their staff and farmers there for training. In operational terms the biggest problem faced by the farm is lack of transportation for extension work and monitoring. The biggest problem faced by local farmers is lack of (seed corn) capital
to purchase farm implements. J.J. Kanjange (Director) PO Box 26, Matale, Ntcheu, Malawi.
Shiré Highland Organic Growers Organization. Group of certified organic growers in Malawi- mostly on expatriate farms but attempting to outreach to indigenous farmers. Arthur Schwarz. PO Box 930, Blantyre, Malawi.

Mali
Groupe de Recherches et d'Applications Techniques. Rural development group promoting OAA. Yacouba Tangara BP 2502, Bamako, MALI

Mozambique
Organic Cotton Project. Group involved in promoting organic cotton growing and other forms of organic agriculture. Norberto Mahalambe *lampab@zebra.uem.mz*

Nigeria
Regfos Green Commission. Established NGO. Sunny Okwudire 7/13 Murtala Mohammed Way, PO Box 531 Jos, Nigeria

Senegal
Agriculteurs Naturalistes. El Hadj Hamath Hane, *agrinat@enda.sn*
Association des Jeunes Agriculteurs de Casamace. Lamine Biaye, BP11 Sedhiou, Senegal
Centre d'Initiatives et de Recherches Paysannes pour l'Environment et le Développement Durable. Ibrahima Seck *iseck@moncourrier.com*
Federation des Agropasteurs de Diende: farmer based research extension and experimentation group. Papa Gueye, Keur Abdou NDOYE, Route de Kayar, Région
de Thies, Sénégal.
Recours á la Terre. Run a 5 ha. demonstration garden and experiment with locally appropriate forms of organic production and have run collaborative research and extension programmes with national and regional producer groups. Abdoulaye SARR, BP 290 Tambacounda, Sénégal. Senegalaise pour le Promotion de l'Agriculture Biologique. Sheikh Tidiane Dramé, *aspab@telecomplus.sn*

South Africa
Biodynamic Agricultural Association of South Africa. Intending to set up a certification and inspection agency in South Africa. Pieter Geernat PO Box 115, Paulshof 2056, South Africa.
Food Gardens Foundation. NGO promoting food self-sufficiency in poor townships and

rural areas. Allda Boshoff *fgf@global.co.za*
The Rainman Landcare Foundation. NGO involved in promoting water harvesting and organic agriculture. Dr. Raymond Auerbach, P.O. Box 2349, Hillcrest 3650, South Africa.

Togo
Groupement des Jeunes pour l'Entraide et le Development (GJED) Young peasant farmer group promoting organic farming in the Western plateau area of Togo. The main aims of the group are experimentation with OAA and dissemination of successful methods amongst villages. They have established a primary school where organic garden and teachings are at the heart of the curriculum. Although they intended this to be a pilot project, they have not yet raised funds to replicate the venture in other villages. They have also established an information / documentation centre where people can come and find out more about agroecology. They are seeking funding to translate key texts and information into local languages so that villagers can more readily avail themselves of this resource. Komla FOLY *komlafoly@yahoo.com; gjed536@hotmail.com*
WWOOF Togo – the only 'Working Weekends On Organic Farms' group in the South that is registered with IFOAM. Yawo Tonato Agbeko *wwooftogo@hotmail.com*

Uganda
Kulika Charitable Trust. Training organisation recently relocated to Uganda. *kulika@compuserve.com*
Mirembe Self Help Organization of Uganda. An active NGO group within the Ugandan OAA scene. They established a demonstration farm for organic farming and Agroforestry in 1992 and provide extension and training facilities. Their interests also cover appropriate technology and are renowned for having developed a cassava flour substitute for cement. They have now been elevated by the government to the status of The National Resource Centre for Sustainable Agriculture and Participatory Rural Development (NRC-SAPRD) and are expanding their role from a regional to national level. They are also centrally involved in setting up the first national organics conference and trying to develop the organic sector. Elisabeth Nabanja-Makumbi PO Box 18272, Kayunga-Bugere UGANDA.
World Vision, Contact Fred Wajje, who is also IFOAM co-ordinator for anglophone African countries. P.O. Box 5319, Kampala UGANDA *Fred_wajje@wvi.org*

Zimbabwe
Zimbabwe Organic Producers and Processors Association. Tom Deiters *Tdeiters@africaonline.co.zw*

Asia

Bangladesh
Proshika. NGO seeking to promote economically viable ecological farming practices into Bangladesh. *Zhossain@prokisha.bdonline.com*

China
Agroecology Research Institute, China Agricultural University, Beijing. One of China's leading agroecological research centres. Li Hufaen *lihufaen@mail.cau.edu.cn*
China Green Food Development Centre, Shi Songkai *cgfdc@agri.gov.cn*
China National Green Food Corporation, Shi Yongzhu *organic@chinagreenfoods.com.*

Intercontinental Centre for Agroecological Industry Research and Development. Li Zhengfang *icaiard@ilonline.com*
Nanjing Global Organic Food Research and Consulting Centre Xi Yunguan, *ofrcc@jlonline.com*
Organic Food Development Centre of China, Xingji Xiao, *xiaoxi@public1.ptt.js.cn*

India
Campaign for Organic Farming. Kranti Prakesh, *Kranti_Prakash@hotmail.com*
Green Foundation. Vanaja Ramprassad *nanditha@blr.vsnl.net.in*
Institute for Integrated Rural Development.

Alexander V. Daniel *iirdind@bom4.vsnl.net.in*
International Society for Nature Farming. I.S. Hooda *hau@hau.ren.nic.in*
Navdanya. NGO supporting the development of community seedbanks. Vandanya Shiva *vshiva@giasdl01.vsnl.net.in*
Peermade Development Society. C.K. George *pedes@md2.vsnl.net.in*
People's Organic Farm. Established in 1981 and initially focused on establishing collective farm units. Have subsequently developed watershed management, herb based community health and conservation of medicinal plant programmes. Are currently considering developing organic agriculture as they recognise that is the only way forward for Indian peasantry to escape cycles of indebtedness. They are currently developing local farmers groups to experiment with biodynamic methods. Hey are establishing a revolving (repayable) fund to facilitate farmers to make the initial labour inputs to developing composting systems. It is intended that those initially involved in the project will go onto to train other farmers, thereby creating a self-sustaining network. P. Mariaselvam, People's Agricultural Farm, 34 S. S. Nagar, Nizam Colony, Pudukotti 622 001. India.
Research Foundation for Science Technology and Ecology. Research and advocacy on the dangers of corporatist agriculture. Vandanya Shiva *vshiva@giasdl01.vsnl.net.in*

Indonesia
Pusat Pendidkan Lingkungan Hiduup. Network of environmental education centres, with an interest in organic farming. Contact via *http://www.webcom.com/pplh*
World Food Day Farmers and Fishers Movement. See case study in main text. Gregorius Utomo *ganjuran@indosat.net.id*

Korea
Korea Organic Farming Association. Established in 1978 against government opposition to organic practices. Currently provides training to the National Co-operative Federation groups. Jin Young. 4th Floor, Sungwon B'D 2/3 Garak Dong Songpa Gu Seoul 138-160, Korea
Korean Society of Organic Agriculture – a more academic based organisation, that has promoted a number of national seminars.

The Lebanon
Middle Eastern Centre for Appropriate Technology. Lebanese based but pan Arabic NGO interested in promoting OAA. They have already undertaken some preliminary research into potential of OAA and submitted a funding bid to the EU to help promote OAA in the Lebanon and Syria. Boghos Ghougassian *boghos@mectat.com.lb.*

Malaysia
Centre for Environment, Technology and Development (CETDEM) have a demonstration organic farm with members who visit for advice and training. They have also organised Malaysia's first organic farming exhibition and are in discussion with the government over drafting national standards. G. Singh *cetdem@po.jaring.my* Malaysian Organic Farming Network. Choo Ghee Sekl *geninco@tm.net.my*

Nepal
Ecological serves Centre, Kathmandu. Nationwide NGO promoting OAA. Provides advice, training and extension to farmers working in a range of agroecological conditions. Have supported more than 10,000 farmers since they were set up. Contact Maheswar Ghimire. *ecoce@mos.com.np*
Institute for Sustainable Agriculture Nepal (INSAN). Promoting permaculture in Nepal. Have recently undertaken major review of the state of Nepalese agriculture (see main text for a summary). Bharat Shrestha *insan@vishnu.ccsl.com.np* or Govinda Sharma, INSAN, PO Box 8126, Kathmandu, Nepal.

Pakistan
Sustainable Development and Policy Institute. Subsidiary of the Pakistan Agricultural Research Council, arranges seminars and links

for government functionaries, donor agencies and NGOs.
It is does not deal directly with the farming community.
Nature Farming Research Centre. A research institute at the University of Agriculture, Faisalbad, which is said to have a good track record in demonstrating successful organic techniques, but is less successful at disseminating results to the farming community.
Pakistan Organic Farmers Association. Syed Asad Husain 78 West Wood Colony, Lahore, 53700

Palestine
Palestinian Agricultural Relief Committees. Ismael Daiq *pr@pal-arc.org*

The Philippines
Broad Initiatives for Negros Development (BIND). See section on Philippines in main text. Eva de la Merced, BIND Rm, 2F CGT Bldg. Locsin cor. Luzuriaga Sts. Bacalod City, Negros Occidental, Philippines
Flora Community. See section on Philippines in main text. Loiue Amongo c/o Masipag, 3346 Aguika Street, Rhoda Subd. Bgy. Anos, Los Banos, Laguna 4030, Philippines.
MASIPAG. See section on Philippines in main text. Angelina M. Briones (as above).

South Korea
HanWooMool Farming Co-operative – involved in promoting organic agriculture through extension and schools, and manufacturing traditional herbal remedies for export to Japan.

Sri Lanka
Gami Seva Sevana. NGO with interest in promoting organic agriculture and village self-reliance. L. Ranjith S. de Silva *Irsdes@eureka.lk*
Nagenahiru Foundation. Conduct farmer field research in indigenous and agroecological practices in remote parts of Sri Lanka. They attempt to disseminate results of best practice within local communities and run a demonstration farm where the techniques can be displayed. Lal Emmanuel (President) *Nagenahiru@mail.ewsil.net*

Thailand
Green Net. Vitton Panyakui *greennet@asiaaccess.net.th*

Turkey
ETKO. Currently has two projects: one in the southern part of Turkey where rural poverty is a harsh reality, the second in the mountainous western of Turkey, mostly focused on fruit producing (apples, pears, plums, cherries etc.). Both need assistance in agricultural advice and marketing. Mustafa Akyuz *etkog@turk.net*

Vietnam
Mountain Resources and Environment Centre. Based at Thai Nguyen University in the north of Vietnam. The centre is committed to developing economically and environmentally sustainable framing systems for this lagging region. It currently has a partnership programme with International Global Change Institute in New Zealand,
in which they are seeking to promote organic agriculture and address the needs of women, the poorest, least educated and ethnic minority groups in the region. Nguyen Thi Mao, MERC, College of Agroforestry, Thai Nguyen University, Thai Nguyen City, Vietnam.
Coopération International pour le Développement et la Solidarité. Nguyen Than *cidsehan@netnam.org.vn*

Latin America

Argentina
Centre for Investigation and Teaching on Sustainable Agriculture (CIESA). NGO promoting OAA as a rural development strategy. Fernando Pia *ciesa@red42.com.ar*
Moviemiento Argentino para la Produccion Organic (MAPO). Umbrella grouping for organic movement in Argentina. More commercially oriented. Rodolfo Tarraubella. *organico@mapo.cc*

Bolivia
Assoc. de Organisaciones de Productores Ecologicós de Bolivia. Francisco Mollo *aopeb@mail.megalink.com/aopeb*

Brazil
Assessorias e Servicios a Projectos em Agricultura Alternitiva (ASPTA). Jean Marc von der Weid *Aspta@ax.apc.org*
Associaçâo de Agricultura Organica (AAO). Wanderley das Neves Cardoso organico@uol.com.br or Ricardo Cerveira *rcerveira@ig.com.br*
Instituto Biodinámico. Biodynamic development and certification agency, which also runs a organic seedbank. *ibd@laser.com.br*

Costa Rica
Asociación Nacional de Agricultura Organica. Gabriela Soto Munoz, *gsoto@cariari.ucr.ac.cr*

Honduras
COESECHA- working with some 45,000 peasant farmers in Honduras and Guatemala promoting sustainable (predominantly OAA) agriculture. Roland Bunch *rolando@cosecha.sdnhon.org.hn*

Mexico
Grupo Interdisciplinario de Tecnologia Rural Aproprida. Mexico's appropriate technology group, involved in promoting OAA. Mater Astier, *giraac@yreri.crefal.edu.mx*

Paraguay
Centro de Educación Capacitacion y Tecnologia Campesina. Rural development NGO with an interest in OAA. Andres T. Wehrle *cectec@sce.cnc.una.py*

Trinidad and Tobago
Trinidad and Tobago Organic Agriculture Movement. Everard Nicholas Byer *ttoaml@email.com*

Endnotes

[1] And, given the importance of the European market, the EU standard is at present the most important.

[2] The term organic production also includes two slightly more esoteric approaches, 'biodynamics' and 'permaculture'.

[3] As Raviv (op. cit.) points out, this simultaneously brings general environmental and health benefits but also undermines the attractiveness of organic produce to consumers in the long term.

[4] In this discussion we exclude traditional 'extensive' farming systems such as 'slash and burn' or extended fallowing, which do not incorporate soil fertility management practices. Such systems often rely on low (human) population density for their viability (Harrison, 1987) and, as population pressure increases, are becoming less sustainable.

[5] As the project evolved, numerous other web sites, mostly belonging to organic and rural development agencies, were visited. An annotated catalogue of these sites is provided in appendix 1.

[6] These included: Bernard Geier (Director, IFOAM), Rodolfo Tarraubella (President MAPO, Argentina), Lukas Kilcher (FiBL, Switzerland), Dr. Uli Zerger (SÖL, Germany), Torsten Piecha (The Amber Foundation, Germany), Carlo Ponzio (Sultan Farm Co. Ltd., Egypt), Tadeu Caldas (Ecotropic, UK) and John Myers (Soil Association).

[7] A further IFOAM publication, the organic training directory (IFOAM, 1995) was considered as a potential resource, but is both out of print and quite dated.

[8] The earlier of these were commissioned as part of the process of informing FAO's decision over whether to include organic agriculture within its sustainable agriculture programme. The more recent reports follow on from their decision to do so, and are concerned with identifying a strategy for promoting OAA.

[9] In some instances our surveys identified higher levels of certified organic land than the work undertaken by SOL, particularly in the case of China and Uganda. In the interests of consistency (and because we have not verified these figures through other sources) we retain SÖL's estimates for this comparative estimate, although discuss the other figures in the country profiles elsewhere in the report.

[10] Although normally considered part of Oceania, for the purpose of this analysis, Papua New Guinea has been included within Asian statistics.

[11] At present there are only three countries that have achieved this status, Argentina, Bolivia and Brazil, all of whom rank highly amongst the top dozen organic producing nations.

[12] For example, Scholer (2000) suggests that more than 90% of coffee grown in Ethiopia is probably de facto organic. If included in the figures this would probably exceed all the certified organic land in Africa.

[13] However interpretations of these statistics should be treated with some caution as cultural, linguistic, geographic or historical factors may account for different organizational structures in different countries.

[14] IFOAM President at the time.

[15] Although increasingly these consultancies are opening regional offices in the South and employing locally-based staff (Hardy, Pers. Comm.)

[16] At the same time they also recognised and accepted the potential value of GM agriculture.

[17] FAO Agriculture Department's Senior Technical Advisor

[18] As well as studies referenced in this report FAO have recently published and / or are presently preparing reports on: factors influencing organic policies with a focus on developing countries; organic agriculture in Senegal; methodology for comparative analysis of organic, traditional and conventional (sic) agriculture; a comparative study of different organic fertilisers; technical Guidelines on Conservation and processing of organic fruits and vegetables and on organic horticultural production.

[19] Some schemes have a specific focus on increasing farmer incomes through helping them access premia markets, for example Swedish Government financed "Export of Organic Produce from Producers in Africa" – EPOPA.

[20] In our opinion Walaga overlooks some constraints, which are identified by other authors and discussed later in this section.

[21] Although, with a growing tendency for setting up regional offices, employing local staff, this is becoming a less pressing issue.

[22] Although commentators closer to the ground argue that these claims have been significantly exaggerated and while Cuba has achieved a transition to a more sustainable and less intensive pattern of agriculture it is, with the exception of isolated initiatives, far from organic (Kilcher, pers. comm.,).

[23] Another example of economic circumstance driving a change to organic methods is reported from (the former) East Germany. When barley growers couldn't afford fungicides they inter-cropped different barley varieties. Mildew infection fell from around 50% to 10%, but after the fall of the Berlin Wall they reverted to mono-cropping because the brewers preferred single variety grain (Stott, 2000).

[24] Equally, we find that Walaga's argument that population pressure is encouraging farmers to intensify traditional systems not entirely convincing, as it might equally well act as an incentive to adopt (more sophisticated) organic practices, especially given the problems associated with purchasing artificial inputs.

[25] One Senegalese farmer is memorably quoted in Thiam and Dieng (1989) 'without chemical fertiliser it is better to go to bed than to cultivate.'

[26] We note here that given a lack of use of artificial inputs, conversion can be achieved relatively quickly.

[27] In addition to these countries the authors identify that organic farming is practised in Burkina Faso, Ghana and Zambia, although no figures are available.

[28] Full details of ICIPE's research activities can be found in their Business Plan and Research Outlook, (ICIPE, 2001).

[29] Given that the Directory is produced in the Philippines this figure may reflect stronger local affiliations.

[30] According to ITC, the Korean Organic Association has more than 17,000 members, so the level of activity estimated here could be a substantial underestimate.

[31] ITC estimate that the land in organic production had increased by 25% by the end of 1998.

[32] The authors also identify the existence of organic farming in Pakistan and Taiwan, but without quantifying its importance.

[33] Although both Soil Association and the Swiss certifiers IMO have partner / branch offices in India.

[34] See section 4.3 for more details of this initiative.

[35] See section 4.6 for a discussion of the issues surrounding certification.

[36] Regulations are established within some Provinces, including the State of Rio de Janeiro.

[37] For example it is not permitted to clear forest within 50m of running water (Chubb, 2000).

[38] Earlier models have also been proposed, see for example Shiva, 1995.

[39] A number of methodological issues need resolving. For a discussion of these see Robens and Lanting, 2000.

[40] The issue of intellectual property rights of plants has been a politically sensitive one in India since the 1990s when W.R. Grace won a patent for a fungicide derived from the seeds of the Neem tree. This species was already commonly used for this purpose in India and elsewhere in the world (Bullard, 1995). A coalition of Indian-based NGOs, the Research Foundation for Science Technology and Natural Resource Policy, supported by IFOAM and the European Parliamentary Green Group, mounted a campaign against the granting of a European patent. They were supported by a petition signed by half a million Indian citizens. They successfully managed to get the patent revoked by the European Patent Office on the grounds that there was no inventive step involved in the 'invention' (Anon, 2000b).

[41] According to Blench the International Livestock Centre for Africa until recently discouraged research on donkeys camels, pigs, rodents and indigenous bird species.

[42] An ethnoveterinary medicine mailing list has also recently been created which can be joined by sending a blank email message to EVM@lyris.nuffic.nl

[43] With some important exceptions, discussed below.

[44] Whilst this report was in press the authors' attention was drawn to a new publication (Giller, 2001) addressing the issue of nitrogen fixing in tropical cropping systems.

[45] Omile et al (1999) note that in Ethiopia many farmers complained that soil erosion negates the potential benefits of applying artificial fertilisers.

[46] Thus strengthening the argument for tree planting in such regions which would, in the medium to long term, reduce competing pressures for compostable material (Omili et al, 1999)

[47] Originally published in 1986, the new edition had been significantly updated and expanded.

[48] Other key texts in this field, identified but not consulted by the authors, include: Elwell and Maas's (1995) practical guide to pest control in South and East Africa and Hoffman and Frodsham's (1995) manual of natural enemies of vegetable insect pests.

[49] Technical solutions to detect attempts to cheat certification systems have been developed by Terra Preservada Alimentos Orgânicos in Brazil to monitor for GM contamination of soybeans (Colkusi & Grüninger 2000). In Sri Lanka tea buyers are experimenting with comparative time series data to spot likely cheating and reduce the frequency and cost of inspections. Farmers whose yields are significantly above local/regional averages or past levels of production would be subject to more rigorous/frequent inspections (Ranaweeera and Thatill, 2000).

[50] This despite the emphasis of the original letters of inquiry being upon agriculture rather than upstream and value adding activities.

[51] Published by Grolink and available electronically at www.organicstandard.com

[52] This derogation is due to expire at the end of 2004, which raises questions about how producers from non listed countries will be able to secure market access thereafter.

[53] A further three Southern organizations: in Argentina, China and Thailand, are in the process of applying.

[54] See Stopes et al. (2000) for a more detailed discussion of the regulation of biocides.

[55] At present the IFOAM charter includes a commitment to: 'allow everyone involved in organic production and processing a quality of life conforming to the UN Human Rights Charter, to cover their basic needs and obtain an adequate return and satisfaction from their work, including a safe working environment'. (IFOAM, 1996)

[56] Notably, however, one Swiss certifier will not permit organic produce to be air-freighted (Hardy, pers. comm.)

[57] This will only be possible in some situations. There is some concern over the organic standards introduced in theUSA, which some fear might place a 'ceiling' on standards, making it difficult to advertise food that is bio-dynamically or locally grown (Burton, pers. comm.).

[58] Cuba aside, one notable exception to this is the recent (and unprecedented) decision by the parliament of Zanzibar to convert to 100% organic agriculture, though it remains questionable how readily this can be achieved (Hampl, 2000).

[59] See Morgan and Murdoch (2000) for a discussion of this issue in a Northern context.

[60] This popular notion is, however, challenged by Chinnakonda and Lanting (2000).

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For some, talk of 'sustainable agriculture' sounds like a luxury the poor can ill afford. But in truth it is good science, addressing real needs and delivering real results.

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