II. LAND TENURE

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1. INTRODUCTION – METHODOLOGY AND SCOPE

This report is the result of a review of existing literature, together with a week of interviews in Monrovia comprising individual and group interviews on issues of land tenure. The literature reviewed is listed in the section '*References and Related Documents'*.

This report will not review the fundamentals of African land tenure in general, or give a description of the general features of postwar land tenure, or general land tenure in Liberia. These have been described elsewhere for African land tenure (Bruce and Migot-Adholla, 1994; Bruce *et al*., 1994; Platteau, 1996; Platteau, 2000; Quan, 2000; Toulmin and Quan, 2000), postwar land tenure (Roth *et al*., 1994; Marquardt *et al*., 2002a; 2002b; Unruh, 1995; 1996; 1997; 2001; 2003; 2004; 2005), and Liberia (IGC, 2004; Richards *et al*., 2004; Richards n.d.; Sawyer, 2005). Instead this report will focus on: 1) a description of the primary and secondary problems and issues, and 2) suggestions for a way forward.

2. PRIMARY LAND ISSUES

The problems and issues described herein are some of the primary concerns in postconflict land tenure for Liberia, and will probably affect the land policy and reform work. They are described in their problematic character below, and potential approaches to them are addressed in the following section on *'The Way Forward.'*

2.1 Landholding types, tenure security, investments, and technology adoption

For the smallholder sector there are five broad types of landholding, with different levels of tenure security: 1) deed holders (or holders of other documents) with a comparatively high degree of tenure security; 2) customary occupation without a deed resulting in relative security within the customary domain; 3) rental or leasing of land with lower security; 4) 'strangers' or 'borrowers' of land who are not from a local area and who do not rent, but are allowed very temporary and insecure access to land, and must supply a token amount of the crop produced to the owner to acknowledge that the land is owned by another – in essence acknowledging that the land is being loaned; and 5) squatters, who although they can be evicted at any time they are discovered by the owner, are also the most aggressive about attempting claim through tree crop planting and forms of adverse possession. While there is a comparative difference in tenure security between the types of holding, all suffer from poor tenure security and issues emerge when the different types interact. The subsections below describe the primary problems with each type of holding.

2.2 Deed/document holdings

While a deed holder is one of the most secure arrangements for a small or large landholder, when renting or loaning land out, the actual insecurity of this form of holding is such that there are strong prohibitions against making permanent improvements on the land by the tenant, for fear that the presence of economically useful trees and other improvements may be used as a form of permanent claim to the land. The lack of a registry of land means that no systematic records system exists whereby one can determine the true owner of land, those to

whom all or part has been sold, boundary locations, inheritance, the role and validity of historical deeds, and the presence of fraud. This puts the legitimate deed holder in a vulnerable position. Thus the fear of counterclaims (based on investments made by tenants or documents held by others) is based on commonplace experience. The lack of a national land registry results in two problems. 1) The growth over time of enormous confusion over what has been sold, subdivided, inherited, etc., and to whom. The result is an inability to be certain of the owner, area purchased, or existing counterclaims. 2) The creation of a situation whereby opportunists are able purposefully to make multiple sales of the same land, with few or no repercussions. In one sense this is a variation of the 'culture of impunity' that exists after a war.

Other problems include confusion over the different types of deeds, problems with adjudication, including enforcement of decisions, the theft of deeds during the war (particularly from the National Archives), destruction and loss of deeds, misrepresentation involving deeds, and the high degree of ambiguity, low capacity and high confusion in the land and property institutions. This has resulted in the value of a deed as a piece of evidence (argument for a claim) being decreased relative to other forms of evidence for a claim. While a deed can be a good piece of evidence, because there are so many problems regarding land deeds it is not nearly as good as it could be, and thus does not provide adequate tenure security in the current institutional environment. A particular issue that combines with the decreased value of a deed as evidence for a land claim is the interaction between deeds and tree crop planting as forms of claim - beyond that noted above. While the connection between planting economically viable trees and land claim is not included in formal law as a way to acquire land, it is nonetheless a very strong notion in the customary sector, including customary farmers with deeds. Even a deed holder will not allow a tenant or borrower of land to plant trees for fear that it may be used as an attempt to claim land. This is an important interaction between formal law (deeds) and customary norms (tree crop equals land claim) that needs attention, because it acts as a significant constraint on both tenure security and technology adoption. Deed holders themselves, however, can and do plant economic trees, both to pursue economic returns, and to further strengthen claims to land. However, as noted below, there are still constraints to tree planting (and making other investments) among deed holders.

In addition to the possession of deeds, the fieldwork performed in Bong County revealed a variety of other documents in circulation in rural areas that are used as proof of claim to landholdings. They are apparently quite securely locally, although of questionable legal standing. There have been cases where local forms of deeds have been issued at the district level by various government and customary offices. These are used as forms of claim, and together with robust tree crop planting by smallholders involved in this type of holding appear to be fairly secure within local communities. This is a category of occupancy where the formal practices (documentation of holding) interfaces with poor customary understanding of what constitute legal documents in land matters. Tenants and land 'borrowers' on this type of holding are expressly forbidden from permanent improvements such as tree planting, revealing a limit to the security involved in this form of holding – similar to deed holdings.

An additional problem with deeds and documents is the issue of ill-defined boundaries. The surveys that have taken place in the course of issuing deeds have in many cases been carried out in an incomplete and haphazard manner. In such cases, one boundary, for example along a road, is surveyed, and then the instruction by the surveyor to the deed applicant is to "take 300 acres away from the road" with the subsequent boundaries at both the far end of the 300 acres and along the sides of the demarcation left unsurveyed. This leaves it up to the deed applicant to

estimate where the boundaries of the allocation are. The result is a large number of boundary disputes.

The interaction between concessions, fee simple deeds, aboriginal deeds and family and tribal land, and the inability of the formal and customary tenure systems to effectively interact (particularly regarding adjudication) has led to significant confusion, animosity and opportunism. This is an issue that intersects with longstanding problems between Americo-Liberians and indigenous Liberians – in some cases aggravating this divide. The overall effect is decreased tenure security, which then acts as a constraint on agriculture investments and therefore production.

2.3 Customary holdings

The customary tenure sector has played a large and positive role in the reintegration and resettlement of dislocates after the war, and from the limited fieldwork performed it does not appear that there are pervasive, explosive problems with land allocation. There are however several issues of significant concern. Important among these are the profound lack of confidence among smallholders regarding forms of customary courts and their ability to adjudicate land issues fairly. This has led to an increase in 'trial by ordeal' for many issues including land conflicts. Trail by ordeal in Liberia involves (among several approaches) use of poisonous plant materials applied to an individual in various ways with the result indicating innocence or guilt. In addition, the prohibition against renters or 'borrowers' of land applying improvements to the land, and specific prohibitions against tree crop planting, are explicit. To a degree, this can act as a disincentive to allow 'strangers' onto customary land for rental or loaning in the first place. The result is that land goes uncultivated, strangers are without land, and food security is not what it could be.

Apparently many of the transactions and problems in the community and tribal areas stem from differences between those who have deeds and those who do not. Maryland County is a particular problem in this regard. One of the processes that lead to this is the granting of land in a 'fee simple' construct when a new road is built and the adjoining land becomes valuable. Those (particularly locals) who have the means can purchase such lands and then determine which communities or individuals already occupying the land can stay or must depart. In addition, the new owner can set conditions by which the community occupants can stay, including labour, rent, etc. Those who depart then move further away from the road and on to land already claimed customarily.

2.4 Rental and leased holdings

For tenants, their comparative insecurity restricts them to annual crops only, with tree crops or other forms of permanent improvements specifically prohibited. Land is often rented only for one cropping season in order to ensure that permanent claims will not be pursued. Rental price varies and is often tied to a percentage of the crop yield. Often, however, rental and leasing of land occurs between neighbours and relatives who know each other well and are able to operationalize forms of informal trust. Even so, those renting or leasing land have reported that if the crop is too successful the agreement may be broken so that the owner can retake the land including the standing crop. This is a disincentive to making even temporary investments in land. Contract rental/leasing arrangements among people who are not familiar with each other are rare. This is most likely due to the low capacity of the legal structure to enforce contracts, and the low level of trust in the legal structure of customary smallholders. In general the

occurrence of renting or leasing land is variable, with communities reporting a range of different situations. The range extends from where rental/leasing is possible but does not often occur, to places where it never occurs, to arrangements frequently being broken and conflicts erupting over rental and leasing engagements. In general leasing is regarded as a good idea, with the exception of where tree crops are involved, even it if does not often occur. There is little knowledge of contracts and how they work.

2.5 Borrowed holdings

Borrowing of holdings can involve people who know each other (lender and borrower) as well as strangers to the lender who essentially are "begging" land. In this case planting trees is strongly prohibited, and a token amount of the crop yield is provided to the owner, in order to acknowledge that the borrower is not the owner of the land and will not claim land. This is a significantly insecure form of tenancy and the smallest infraction can see the borrower evicted. A very good crop can also see the borrower evicted so that the owner is able to take full advantage of the yield. This acts as a disincentive to invest in land in terms of fertilizer etc.

2.6 Squatted holdings

Squatted holdings constitute a large problem in both rural and urban areas. In some cases squatters can be seen as the most aggressive in pursuing forms of land claim involving tree planting or other improvements, and in adverse possession. The latter can be pursued after 20 years of occupation with no attempt by the property owner to evict. There is some discussion within the legal sector in Monrovia as to whether the 14-year civil war period should or should not be counted toward the 20-year period for adverse possession claims. A formal legal decision is needed in the near-term on this issue, as many claims using the 14-year war period are likely to be made soon. Eviction of squatters risks social unrest if carried out on a large scale, is very visible, or if it involves ex-combatants. Tenure security is so low for squatters that in many cases they have little to lose, and so can attempt to claim land in the hope that any resulting dispute will at least result in some form of compensation. Such low tenure security can also result in rural squatted holdings being subject to extraction activities such as illegal timber and rubber harvesting.

2.7 Technology adoption and investments in land for smallholders

The prospects for technology adoption, such as tree crops, and investments such as soil conservation, terraces, or other long-term strategies differ with the different occupancy types noted above. Deed holders face two difficulties in this regard – the issue of multiple transactions over time (including fraud), and boundaries. For the former, the current surge in land and property dispute cases in all forms of courts, not just probate court (between 75 and 90 percent of all court cases in Monrovia are related to land and property), that relate to various problems with deeds means that deed holders who are involved in a dispute, or think that others might in any way have a counterclaim, may be unwilling or less willing to adopt long-term technologies such as tree planting or investments associated with longer-term strategies. For customary landholders the poor management of the relationship between formal and customary law, and the resulting historical taking of land for concessions, discrimination in adjudication, and internal customary problems, make some customary communities reluctant to pursue such investments. Also a problem is that such investments are visible, and if successful in increasing yields, they attract the attention of opportunists able to use the instruments of the state to claim such land. Other long-established, less war-disrupted customary communities, however are

more secure and do not experience such problems to the degree that disrupted, recovering and returnee-stressed communities do. For rented/leased and borrowed holdings the strong prohibition against investments in agricultural land is a primary constraint to improvements in yields. Particularly acute with this group is the desire not to appear too successful as a farmer, for fear that the land will be taken back (along with the standing crop) by the owner, prior to the agreed upon time. As a result there is reluctance actively to pursue strategies that involve technology adoption or investments that would attract attention due to their success.

3. SECONDARY LAND ISSUES

Land issues contributed to the cause and maintenance of the war. During the course of information gathering for this report, it was noted repeatedly the central role that land issues had in the cause and maintenance of the conflict in Liberia, and the high importance of the issue currently. There is a strong depth of feeling regarding land problems that fed into the war, with high levels of resentment being caused by specific land issues, particularly in Nimba and Lofa counties. Many combatants ended up in the war due to no small degree to discrimination of various kinds in their home communities, including over land access. This particularly affected rural youth, who felt ill-treated with regard to land and marriage prospects by the customary sector. Richards *et al*. (2004) include a summary of these discrimination problems.

Several of those spoken to with direct access to the President indicated that she is highly concerned about the issue of land tenure in the country and believes it to be of primary importance, and has passed on her sense of urgency regarding land and property rights reform. Several respondents noted the potential for the lands issue to be a flashpoint, and that the way land issues are dealt with in the peace process has been problematic. Some of those spoken to indicated that a number of issues central to the war have translated into land issues after the war. Others noted that because the different factions held large areas of the country for long periods, the GOL is only now learning about what went on regarding land access, land and politics, claims, etc. Other ministerial officials spoken to indicated that land issues were among the biggest challenges facing the current Government.

A good number of respondents indicated that the war has changed much in Liberia, including social relations with regard to land. Much in customary life has changed, and this will probably be reflected in changed approaches to land and property rights.

4. CONCESSIONS

Concessions for access and exploitation of natural resources lead to a complex of problems. Foremost among them is the considerable confusion about what rights are included or excluded with regard to concession holders. There is widespread understanding that a concession, while issued for the purpose of exploiting timber, rubber, minerals, or agriculture, is in reality a very broad issuance of rights to claim and exploit land resources in whatever way suits the concession holder, although this may have little to do with the business proposal that was used to obtain the concession. In addition, there are significant problems with the actual areas granted as concessions, with the total area granted as concessions in some counties adding up to more than the area of the county itself. There seems to be little connection between the area granted or held and the area to be developed or exploited. Frequently the concession areas granted were much larger than the area actually developed for rubber, agriculture, etc. The mismatch between the area granted to a

concession holder and the area then developed may be quite large, amounting to hundreds of thousands of acres claimed (to the exclusion of others) but not used.

In certain sectors there is some confusion over who has had the authority to grant concessions, particularly because there has been a problem historically in consulting local communities, which creates a good deal of anger and animosity.

4.1 Rubber concessions

Much of the easily accessible land (the 'rubber belt') is under rubber concessions. One of the more serious problems in the rubber plantations is the ongoing presence of ex-combatants (in some cases still armed) in the plantations. Some of these groups are tapping rubber trees and selling the latex, while other groups are hired by plantation owners to protect the plantation and exclude occupants, and still other groups appear to report to former militia commanders for a variety of reasons. At the same time those concession holders who are returning want their rubber farms back so they can engage in effective production again. As a result security is a large problem on rubber plantations. Resolving the presence of ex-combatants on rubber plantations will be delicate. Currently the price of rubber is high, and so encourages extra-legal tapping and makes the regularization of the rubber holdings more difficult.

The Firestone concession was granted in 1926 and a further seven concessions were established in the 1950s. These cover quite large areas (the larger ones comprise hundreds of thousands of acres per concession). A primary problem with these concessions is that usually only a fraction of the total concession was ever developed for rubber. For example in one case a concession was granted for 650 000 acres, but only 5 000 acres was developed; nevertheless the claim for the full 650 000 acres is maintained. Given that US$12 000 is needed per acre for rubber development in Liberia, the investment needed to develop even 100 000 acres is much more than can reasonably be expected to be invested in the country in the near to medium term or perhaps in the long term. Thus the sizes of the concessions allocated for the purpose of developing rubber are, in a significant number of cases, mismatched with the money needed to realize the investment, and as a result much of the land has, and continues to be idle, or at least undeveloped for rubber. Such land is essentially not accessible for other investment, nor can it play a significant role in local or national food security. Currently the issue of rubber concession claims versus local community land claims is extremely problematic. Thus the need for a thorough review of all rubber concessions for technical and legal flaws was noted by several of those spoken to, and it was also a key recommendation of the Rubber Task Force. A key issue in the rubber industry is the size of these concessions versus the desire by smallholder agricultural communities to access land for food security and cash crop production. The issue is made still more problematic because some of the concession holders are of the Liberian political elite.

Some interest was expressed in facilitating greater rubber outgrower arrangements with smallholders. Various constructs were noted, from the needed proximity to buyers of latex and commercial plantations, to forms of community and social forestry, which have appeared to be successful elsewhere. Community and social forestry is an area of particular interest to some donors, such as USAID.

4.2 Timber concessions

The natural forest on all land in the country, including on private land, belongs to GOL and can be allocated under concession arrangements. The exception is forest on private lands that have been reforested by the owner. Thus in Liberia the owner of the land and the owner of the trees are distinct.

Timber concessions have received significant attention due to the international sanctions on Liberian timber imposed by the UN Security Council. Recent efforts to have the sanctions lifted, and international assistance in this regard, have led to a great deal of legal and enforcement effort regarding the issue of timber concessions in Liberia. This has included review of existing timber concessions and changes in how timber concessions are granted. The NTGL established the Forest Concession Review Committee, which recommended the cancellation of all concessions. The Ellen presidency accepted the recommendations and cancelled the concessions through Executive Order #1 in February 2006; this Order also established the Forest Reform Monitoring Committee. These efforts have resulted in the National Forestry Reform Law of 2006, and Forestry Development Authority (FDA) Draft Regulations and Contracts. The FDA is the lead agency for these activities. Currently ten FDA regulations have been drafted and are being publicly vetted. These FDA regulations are important to fulfilling the UN Security Council conditions for lifting all timber sanctions against Liberia. One aspect of these regulations provides for establishing a "chain of custody" regarding timber with regard to location, the specific concession, etc., such that legality and taxes can be determined.

Under the new law forestry concessions can be granted in three ways: 1) a forestry management contract, which is bound by a maximum limit of 400 000 ha and a contract for a maximum of 25 years; 2) a timber sales contract, which is limited to 5 000 ha for three to five years; 3) a forest product use permit, which focuses on non-timber forest products (charcoal, honey, etc.). Competitive bidding for concessions is now promoted as a way to connect the price for concessions to the market.

Significant changes have occurred with regard to the relationship between forestry concessions and local communities. As part of the new forestry law, a new concession cannot be granted without obtaining permission from the local community. Also, a new forestry concession must enter into a "social agreement" with local communities. Additionally, land rental fees are subject to a benefit-sharing arrangement in which the concessionaire pays 30 percent of the land rental to the local communities, and another 30 percent to the county (and the remainder to the MOF).

4.3 Other concessions

Oil-palm and mineral concessions are also problematic and there were recommendations by some respondents that that these too should be reviewed as the forestry concessions were.

5. COMMUNITY AND TRIBAL LANDS ISSUES

5.1 General

Several issues regarding community and tribal lands have become problematic as a result of the war (and land relations prior to the war) and currently constitute a set of important issues

in need of attention. It was noted on a number of occasions that rural people need to have more of a voice on land (and other) questions. The Ministry of Agriculture (MOA) laments that the Tribal Reserve Law has not been respected, complicating the MOA's ability to manage agricultural efforts in the tribal areas. Tribal land is often claimed by outsiders, with the resulting disenfranchisement causing significant problems. Also creating considerable animosity is the arrangement whereby GOL claims to own all the land in the interior of the country, and also has issued concessions without consulting local communities. Adding to this animosity is the lingering perspective that only if one moves from the rural areas to the city and becomes "civilized" (baptized, married according to statutory law) can one own land privately. The Ministry of Internal Affairs (MIA; the primary institution for dealing with community and tribal lands, and including local government) notes that the perception of the community and tribal lands is that the issue is quite confused – although there is some indication that at the village or community level local arrangements operate in greater clarity.

Administrative units in the rural areas that deal with the communities can vary. While the county is the primary subnational unit, clans and chiefdoms are both administrative units with a kin aspect. There are also the units of city, and town. There is considerable disarray and confusion regarding the borders of all these units, as they have been changed repeatedly over time, often with little reconciliation with neighbouring boundaries. The UNDP is currently engaged in attempting to collate the legal documentation involved in such redistricting activities.

5.2 The Mandingo issue

Postwar Liberia has seen tribalism emphasized, particularly with regard to the Mandingo group. The aggravation of tribalism due to the war stems in part from the reliance on close kin for survival, as other networks of social reciprocity collapsed. This is a common postwar feature in Africa (Unruh 1995; 2004; 2006). The Mandingo land tenure issue is a particular problem that needs focused attention. While the history of the issue has been described elsewhere (e.g. Richards *et al.,* 2004), the essence of the problem seems to reside in whether the Mandingos are considered citizens of Liberia or not, and thereby whether they are able legitimately to claim and occupy land. While the Mandingos have been in Liberia for generations, neighbouring ethnic groups insist that they are not legitimate Liberians and should return to Guinea. One aspect of the issue is the conflicts emerging between adverse possession claims by Mandingos and traditional claims by neighbouring ethnic groups. Part of the problem is that the Mandingos sided with Samuel Doe during his reign because he recognized them explicitly as Liberians (Richards *et al*., 2004).

5.3 The aggravation of the Muslim–Christian divide

There is some indication that the war and the current land situation have aggravated a Muslim–Christian divide in some parts of the country. Research is needed in order to ascertain the role that institutions, grievances, and entitlement connected with religion (and tribe, and other groups) have in resolving or creating divisiveness with regard to the land situation.

5.4 Women's issues

Women's issues come to the fore with regard to the land question primarily in terms of land access and inheritance, with these two issues being intertwined. In this regard women tend to

have fewer rights regarding land under customary law than under statutory law. In 2003 a group of female lawyers in Monrovia, the Association of Female Lawyers of Liberia (AFLL), worked to help pass a new law "An Act to Govern the Devolution of Estates and Establish Rights of Inheritance for Spouses of Both Statutory and Customary Marriages" (MOFA, 2003). Thus at present inheritance of land by women is the same under statutory and customary law. Subsequent to passage of the law AFLL created a simplified version and delivered it and other information regarding the law in rural workshops and to rural women's groups, and also distributed audiocassettes containing further messages about the new law in the form of songs and drama to local radio stations. The impact of the new law and the dissemination of the work of AFLL on customary law regarding women, inheritance and land appear to be variable, but will in any case require time and sustained effort for effective implementation. The new inheritance law has received resistance from some rural men (and parliamentarians) who would like to keep the previous inheritance arrangements intact; however others have accepted the new arrangement. In this regard AFLL has noted that Muslim areas are more open to the new inheritance law than other areas. A number of respondents noted that a great deal has changed for women in society due to the war, and having a female president is an important factor.

5.5 Refugees and IDPs

Land tenure appears to be a concern for some refugees and internally-displaced persons (IDPs) with regard to community and tribal land. This can connect with an ethnic dimension with regard to who is or should be attached to which lands. There can in some locations also be a divide between those who stayed and those who fled with regard to land use, reclaim, and eviction. One respondent noted that land access problems are one reason why many remaining refugees and IDPs have not yet returned to their areas of origin. This remaining group, its size, location, current occupation, and precise reasons for access to land may become an issue warranting attention if particular problems emerge. Sierra Leone has experienced significant problems in this regard (IGC, 2004; Unruh, 2005).

The Liberian Refugee Repatriation and Resettlement Commission (LRRRC) has had a role in moving IDPs and refugees (who resided in camps and were registered) back to areas of origin. Reportedly there were considerable efforts at working with local community leadership to facilitate reintegration via land access for returnees. This reportedly included land and property committees at the community level constituted by the LRRRC and comprised of local elders.

6. ONGOING ISSUES NEEDING FURTHER CLARIFICATION

Perhaps the primary land tenure problem in the country as a whole is the massive confusion that exists over a range of administration, boundary, claim and ownership issues. The link between such confusion and wide ranging tenure insecurity is explicit (Bruce *et al*., 1994). Some of the more important issues pertaining to this confusion over land tenure are noted here.

- There is still some disagreement among certain ministries with regard to which ministry will take on what components of land and property administration and operation. While it is clear that the Governance Reform Commission (GRC) will be responsible for the policy aspects, the cadastres and geographic information systems, administration on different topics and at different levels, survey, concession authorization for different uses,

and the financial aspects of land and property still need to be sorted out among interested ministries.

- Subsequent to the conflict there exists a great deal of ambiguity regarding the physical location of relevant laws, regulations, records, registries, statistics and other relevant documents. While a great many of these have been destroyed or irretrievably scattered, others exist in private residences or as part of small personal archives of those who worked or work in the various government, university and private offices. While the personal acquisition and possession of such documents has provided an invaluable service to the country during the war, in that it has prevented such documents from being permanently lost, currently there is considerable difficulty in locating and gaining access to such documents. In part this is because individuals in possession of such documents are understandably extremely reluctant to part with them, even for the purpose of photocopying.
- There is confusion regarding the overall status and application of polices and laws regarding land and property. Those that exist are often unclear, lack effective implementing regulations, and are often very dated and so do not adequately serve the present Liberian reality. A good deal of the law received from the United Kingdom via the United States can be unsuited to the present Liberian reality. Thus there is ambiguity regarding which laws have been applied in which cases and how, particularly with regard to the granting of concessions and resolution of disputes. The physical absence of these laws complicates this problem.
- There is considerable confusion regarding what constitutes legitimate evidence for land and property claims. This has led to a good deal of speculation, and the use of historical documents of varying degrees of relevancy.
- As noted above there is a good deal of ambiguity about what rights are and are not included in a concession. Particularly important in this regard is the right to exclude others (local communities).
- The court system constitutes a problematic and legally pluralistic arrangement for solving land and property disputes. A variety of procedures are used, depending on the actors, the context, and the issue at hand.
- Fraudulent and ambiguous land transfers have created a great deal of ambiguity regarding who has rights to what lands, and how defensible these might be. Some of the cases in this category are explosive. Confusion over long-term and multiple transfers is a particularly difficult tangle, as is the existence of incomplete documentation.
- The general lack of clarity in land rights is increased by the existence of the dual tenure systems in the country (statutory and customary). While such duality is not in itself a problem – as co-existence occurs in other countries– in Liberia there is no clear understanding about what rights go with which system. Also, there is no legal or institutional mechanism whereby disputes and other issues between systems can be resolved. As a result the level of legal ambiguity is quite high and problematic.
- There is no land use plan/policy that stipulates what can go on where in the country. This leads to improvisation, and such improvised decisions will need to be taken into account when a land use plan is drawn up. A broader problem is that a great deal of land tenure decisions need to be made as a matter of every day life, and the need for such decisions does not wait for laws, policies or plans to be drawn up.
- There is confusion regarding different types of ownership, with the types needing greater definition – including the issue of who owns the land in rural areas, the Government or the people, and who within the population owns which lands and properties under what

forms of claim. In an institutional context this is a problem because even the buildings for rural government offices need to be rebuilt, but it is unknown who owns the land.

- Effective boundary demarcation is a problem, both for counties (and subunits) and concessions. In a number of cases how much land exists in the various counties and concessions is unknown. In others, incorrect numbers are used to calculate such areas. One cause of this problem is that a great deal of redistricting has occurred in rural areas during the various previous regimes, particularly during the conflict, for political reasons. Such changes were not adequately recorded as they occurred, including with regard to shared boundaries. Complicating this is that during the 1990s about half of the country (as noted above) was under the control of factions and GOL is only now coming to understand what has occurred there regarding the political and administrative change in units. The overall situation is that subnational boundaries are in severe disarray.
- Despite the new inheritance law, there continues to be a great deal of confusion around issues of inheritance – between siblings, between children and between families.
- The rights regarding claims, use, and administration of community land are not fully defined. There are also no working definitions of city, town, clan and chiefdom with regard to the land and property rules that apply to these units.

7. THE WAY FORWARD

The way forward for Liberia in a land tenure context requires attention on several fronts. This section articulates some of these in an aggregate way. Subsequent to a description of a few large issues having to do with the general approach, a list of more specific recommendations follows.

7.1 "Approach" issues

Untangle all issues, or management of types of problems?

Given the severely confused nature of certain aspects of the tenure situation, it is not realistic to pursue an approach in all cases or to seek to untangle what has gone on in order to find resolution – in other words, to seek to unravel the history of transactions. While some cases involving acute (particularly security) problems, and high-profile cases would need particular attention with regard to what went on when, where and with whom, in many cases and on many topics this is not likely to be possible, particularly in a timely manner. Rather, specific policy and legal constructs should be applied to "clean up" certain issues. However, this must be done carefully so as to take into account what has already occurred, as individuals, communities and groups have made decisions about land tenure – with these decisions often being quite binding. If such informal decisions (made outside of law, policy or national plan) are not taken into account, then new legislation will not have traction for the population and there will be a purposeful disconnection from such laws and policies (Unruh, 2003; 2005; 2006). While there are specific technical ways to clean up particular issues, these are best suggested to the Governance Reform Commission for their consideration, and the World Bank can support this process.

7.2 The "category" approach

Related to the above issue is an approach that seeks to reduce the volume of outstanding cases involving disputes, claims problems, evidentiary issues, border problems and restitution; as well as the time and money involved in dealing with them. As opposed to only pursuing resolution of such cases when courts or special tribunals are up and running and

seen as fair, legitimate and effective (an approach suited to well functioning societies), the category approach seeks to delineate categories of problems, or types of similar cases, and then provide a legal approach to dealing with the category. This has the advantage of quickly reducing the overload on courts, as well as the time, money and effort needed to go through each and every case. Liberia has just accomplished a form of this approach in deciding to cancel and review all forestry concessions as a category. Such categories can be as narrow and as numerous as deemed necessary to capture the important differences between sets of problems, and to deal with certain problems in a short time frame. While not all tenure problems can be dealt with in this manner, it does, again, have the effect of reducing the volume of cases (Unruh, 2002).

Laws and policies that attend to postwar issues are different from those that serve a well functioning society. Land and property laws and approaches that best serve a stable society over the long term, and that facilitate capital formation and capital movement with regard to land and property (e.g. de Soto, 2000), are often unable to clean up a postwar land tenure environment effectively and in a timely manner so that approaches that assume stability can operate. While the derivation and implementation of such (stable) laws and policies is of course a necessary objective, there must also be legal approaches able to deal with the host of complicated issues regarding land tenure after a war. These need to come on-line prior to the derivation of policies and laws that are more suited to well functioning societies: banks, a private sector, cadastres, underlying policies, managed discrimination, and fair, legitimate and effective courts, as well as the capacity to operate all these. Issues of retribution, profound inequality in land and property legal pluralism that favours some sectors of society over others in land matters or that add confusion, the presence of non-reintegrated ex-combatants and others, a legal system that is non-inclusive due to rigid and narrow evidence rules, along with other postwar issues, need attention much sooner than the implementation of 'stability assuming' approaches can provide (Unruh, 1995; 2002; 2003; 2005).

One example of a way to attend to postwar problems in land policy reform is to ascertain through research what the most acute land tenure issues are, and then attend to them specifically in law. In other words, ascertain specifically what land rights, or aspects of rights, are problematic, and then deliver that right or a specific form of security regarding such a right to the population concerned. Sierra Leone again provides an example:

> *Leasing is an important form of conveyance, and the concept of leasehold has been extremely flexible and useful in facilitating a separation between the ownership of land and the use of land. Most fundamentally leasehold creates a 'proprietary interest in land'. But significantly relevant to Sierra Leone, the landlord retains what is known as 'the right of reversion,' whereby at the termination of a lease for whatever reason, full rights are returned. This is essentially what the landholding lineages in Sierra Leone currently seek to do with strangers – creating or seeking reasons for a quick forfeiture of temporary rights in order to retain the right of reversion. But because formal law did not allow for the effective retention of the right of reversion in a lease, the lineages seek to retain such a right on their own, by prohibiting the planting of trees and making other improvements, by requiring that tenants move off, or re-beg land annually, and by inventing 'offences' through which the right of reversion is exercised – the only way to be assured that the right still exists. That the promotion of leasing in the Commercial Use of Lands Act seeks to strengthen the right of reversion for the landholding lineages may seem counterintuitive, given that the lineages already go to great lengths to retain this right, with considerable negative repercussions on tenancies, land access, reintegration and food security. The problem however is how the security of this right is retained (Unruh, 2005).*

8. THE TIME PROBLEM

There is a significant time issue with regard to land tenure after conflicts, and Liberia is an important example of this. Given that there is a legal, capacity, financial, administrative and equipment vacuum after conflicts, during which individuals and groups, again, must make decisions regarding various aspects of land tenure, it is important to influence aspects of this vacuum so that events and processes do not develop into severe problems. Thus while it takes time to derive new laws and policies – particularly given the poor record of quickly importing legal constructs from elsewhere – filling the period between the end of the war and when such laws and policies come on line is important. In this regard GOL needs to be seen by the population at large to be active in the land issue. This can be accomplished in a variety of ways, including by holding conferences and workshops for stakeholders at different levels and in different locations in the country. This can also be part of the required consultation process that is important to policy formation in land tenure (Unruh, 1995; 2003; 2005).

9. EMERGENCE OF INFORMAL, MICRO "RULE OF LAW" SYSTEMS

There is often significant emergence of informal micro "rule of law" (RoL) systems or "normative orders" regarding land and property rights during and after a war (Kamphius, 2005; Plunkett, 2005), and again Liberia is an example of this. The Mandingo land issue is an important case in which specific ideas of what is or should be norms regarding whether or not the Mandingos should have access to land in Liberia have a widespread effect. In this case the Mandingo population has one set of normative orders that state why they deserve legitimate access to land and how this operates, while neighbouring ethnic groups constitute another RoL system with arguments as to why the Mandingos should not be allowed legitimate access to lands. Other RoL systems that emerge include, but are not limited to, ex-combatants, squatters, divisions based on ethnicity and religion, individuals and communities not allowed to re-access lands, and communities that believe themselves to have been unjustly treated in a variety of land-related issues. While the emergence of such informal RoL systems is not in itself a problem, given that some can serve specific needs and contribute to effective policy reform, others, and the way in which they are operationalized can cause problems if not attended to. Such informal RoL systems need to be taken into account in the derivation and implementation of new land laws and policies (Kamphius, 2005; Plunkett, 2005).

10. THE EVIDENCE PROBLEM

Evidence for proving claims to land and property is a particular problem after wars and in Liberia in particular. Much of the desire to untangle the legal and transactions history of the land tenure problem in the country stems from the need to perform some kind of "proving" as to who should get legitimate access to what lands. The lack of registries and deeds, and the problem of attempting to resolve conflicts whereby one party has a deed, title or other document, and another party does not, are manifestations of this evidence problem. Over-reliance on a need for documentary evidence in such cases can cause significant problems. Other countries emerging from conflict (Mozambique, Sierra Leone, East Timor) have found utility in reworking rules about evidence, to allow a very wide variety of evidence into attestations of claim (Unruh, 2006). In Mozambique customary evidence involving testimony (parol evidence) is now equal to possession of a title in land disputes – with positive results (Unruh, 2005). While in a strict, legal deterministic sense it may be argued that equating documentary evidence to forms of customary evidence can detract from the integrity of the

document in matters relating to land, such a concern is out of place where most do not have documentary evidence, and is very much out of place after a prolonged conflict. At the same time it is well within the Western legal tradition (wherein Liberia's own legal history resides) to hold that "relevancy" is the primary evidence rule in civil cases. With such a rule, and with a wide variety of formal and informal evidence admissible, Mozambique has found that many disputes became "self-resolving", thus sidestepping the problem of lack of courts or tribunals (or the capacity to run them) to hear land cases after a war (Unruh, 2006).

11. THE DUAL LAND TENURE SYSTEM

The existence of both statutory and customary land tenure systems in Liberia is seen in a number of ways, including in the context of leading to problems. However virtually every country in Africa has this duality, and it exists as well in a number of developed countries. Such duality *per se* is not problematic, but the way it is handled can be. In Liberia there needs to be much more mutual recognition and connection between the two systems than there currently is. The purposeful separation of the two systems over a good deal of time has led to their non-integration, discrimination when they do come into contact, and has prevented the evolution of positive and mutually beneficial ways of interacting. In addition, the lack of a robust effort by Liberian researchers, particularly lawyers, to derive innovative ways in which the two systems can interact, has further isolated the two systems from each other in functioning, recognition, and integration. New land and property laws and policies would do well to pursue considerable connection with customary forms of land tenure, particularly in terms of court systems, evidence, levels of dispute resolution and appeal structure, claim, consultation, and issuance of concessions, titles, deeds and use. This of course coincides with efforts at decentralization. The advantage of encouraging such connection is that the state will not then be in a position of attempting to administer and enforce statutory law in all areas of the country – which it will not be able to do in any case. Thus recognizing and cooperating with customary law offers the advantage of obtaining a free good by GOL –administrative capacity and function located pervasively in rural Liberia at no cost to the state. Such a connection between formal and customary tenure systems is, however, different from re-instituting aspects of the customary tenure system that contributed to the onset of war. The customary tenure system itself needs to evolve to meet the current needs of the population. It can be argued that the isolation and neglect of the connection with statutory law and the lack of awareness of legal developments in other countries has led to the stagnation of parts of customary tenure in Liberia, which has resulted in the problem of rural youth and women being unable to gain effective land access. The lack of connection that could have resulted in considerable positive co-evolution between the two tenure systems has in one sense led to the non-consultative approach of GOL in issuing concessions, titles and deeds, as well as the claim that all rural land belongs to the Government.

The primary suggestion here would be to begin a more robust process of connection and co-evolution between the two tenure systems. In this regard the recovering legal sector, the university, NGOs and donors can provide a good deal of quality input into the process. Neighbouring Sierra Leone has the position of a "customary law officer" in a number of rural areas who stands at the interface between the two systems. While there is a need to strengthen this in rural Sierra Leone, the example is instructive as to how to build a better flow of information, cases, examples, decisions, needs and aspirations between the two tenure systems, thus assisting them to co-evolve. Zambia also employs such an approach in quite a successful way with its "Law Development Commission".

12. RECOMMENDATIONS

- The Governance Reform Commission (GRC) is currently undertaking policy reform and coordination in land tenure for the country. The GRC has considerable capacity and has a mandate to lead on the land tenure question in the country. The World Bank and other donors will need to work with the GRC in this coordination, support and reform role.
- The World Bank needs to consider adopting something akin to a "components approach" to land tenure work in Liberia. Such an approach would entail outlining the suite of relevant components in existence (and needed) for the broad complement of services, policies and laws regarding land tenure, and then working with the GRC to coordinate these and assist in funding and building capacity with the "weak links". An initial description of such components together with related recommendations is described below in the section "*Overview of Land Tenure Components"*.
- Capacity is extremely low within the different institutions that will need to play various roles and functions within the land and property domain. Capacity building and retention in this regard is greatly needed.
- There is a serious need to review the rubber concessions. The continued claim of very large areas under rubber concessions, while only a small fraction of the total area has ever been developed, presents significant problems for local communities, food security, and potentially stability. The precedent set by the FDA in reviewing all forestry concessions sets an important example for the rubber sector. Such a review might hold as a priority the reduction in size of the area claimed to more appropriately reflect actual or potentially realistic development under rubber.
- The legal construct of "concession" in Liberia needs thoughtful review. A common use of concessions is for a specific use right, for a specific business proposition. Such an issuance comes with penalties, including forfeiture of the concession if the business plan is not realized in due course, or if violations in use occur. In Liberia concessions have historically been issued for certain purposes, rubber, timber, mineral, etc., but in reality the concession holder can exploit the concession area for virtually any use, with no effective review of the proposed business plan nor consequences for non-compliance with the plan. There also appears to be (at least in practice) the notion that concessions include the right to exclude others, and this has presented considerable animosity among local communities that are then either evicted or subject to conditions in order to remain. As it stands, many concessions operate as a form of private property.
- Along with the review recommended above, the options of leasing, licensing and other forms of conveyance can be explored in order to pursue commercial exploitation of land resources, while not relieving local communities of their lands, use rights and livelihood. Forms of leasing and licence are much easier to provide to foreign and other investors in a secure way than is private property, which for rural areas includes the right to exclude over large acreages. The non-cooperation that the latter would provoke would then impact on the security of the holding for the investor.
- The land and property sector is in need of a comprehensive document retrieval effort, in order to copy and store in an archive(s) the laws, deeds, titles, registries and other forms of land and property related documents that exist.
- The Liberian Law Journal needs to be revived and provided with assistance to become a link that takes on issues such as the co-evolution of the formal and informal tenure systems. The reporting in such journals is, in other countries, used in deriving innovative approaches to legal and policy problems.
- The ambiguity issue is leading to significant problems, delays and, most importantly, tenure insecurity. Research would show the degree to which such ambiguity is a reality in

the rural tenure sector, or whether local leadership and the reworked social relations regarding land have resolved such "who owns what land" issues. In other words is the rural tenure situation primarily ambiguous from the perspective of Monrovia, while from a more local perspective claims, disputes, norms and institutions are becoming resolved, or is there real ambiguity and confusion that is "stuck" in its present state with local actors unable to move forward on resolving local land tenure issues? There is some evidence that the former is the case.

13. Overview of land tenure components – Liberia

This is a brief overview of some of the existing and required land tenure components as currently understood. There is a need to bring the different components into a cohesive whole, and support should be provided to the weak links. Each component listed below includes its present status and need in order to be coordinated with a broader land tenure programme in the country.

1. *Governance Reform Commission (GRC)*
   a. Headed by Amos Sawyer.
   b. Has the lead on the governance reform and legal reform aspect of the land tenure issue in the country, as appointed by the President. Reports directly to the President.
   c. World Bank consultant to work with the GRC on issues of research to inform policy reform, law and land reform issues. Consultant also to make available the experiences of other postconflict countries.
   d. GRC has overview of the different components of the land issue in the country.
   e. GRC has expressed interested in putting on a national and then regional level (in the counties) stakeholder conferences and workshops to:
      - initiate the consultative process;
      - indicate relatively quickly to the populace at large (as well as GOL and potential investors) that movement is underway regarding land and property issues.
   f. Both items above are significantly important particularly in the short term. Funding is needed to support the conference/workshops.
2. *National Information Management Centre (NIMAC) within UNDP*
   a. Margaret Hall, Manager
   b. Ms Hall has a team that is currently putting together an array of spatial and relevant legal information in order to come to an understanding of the situation in rural and urban Liberia regarding boundaries – county, district, city, town, clan, chiefdom, etc. The work NIMAC does is crucial to the eventual formation of a cadastre, registry and other administrative aspects of a functioning land tenure system.
   c. The units within GOL that would do this work have an extremely low level of capacity, to the degree that the required work cannot be accomplished, at any pace.
   d. NIMAC is in need of additional funding to continue operating and this should be a priority.
      - This funding should include a significant capacity-building effort that connects with the Ministry of Lands, so that its personnel can be trained and move into the creation and operation of cadastre, registries, etc.
3. *The different concession review processes are very worthwhile and much needed: forestry (completed); rubber plantations (needed); oil-palm concessions (needed); mineral concessions (needed); church holdings (needed?)*

a. The UNMIL/GOL Rubber Plantation Task Force is currently reviewing some rubber concessions for, among other issues, congruence between land areas claimed and the land areas actually developed.
   - The Task Force is in need of additional funding.

b. The approach towards other concession problems (oil-palm, minerals) should be determined.

4. *Customary (smallholder) issues over land and property*
   a. The University of Liberia Institute for Research is now well placed and currently has appropriate capacity to assist with the "research-to-inform-policy" effort on a variety of customary land tenure issues.
      - The connection between this Institute and the GRC is well established, and so the linkages exist for the transmission of research findings to the policy domain.
      - Funding is needed for the "research-to-inform-policy" effort.
5. *Ministry of Agriculture*
   a. Currently has a role (in need of greater definition) in land tenure issues, but is in considerable need of capacity building.
   b. It could be envisioned that personnel within the MOA could be attached to the NIMAC effort, as well as the research and policy reform efforts, in order to contribute to such capacity building.
6. *Ministry of Lands*
   a. Has a significant interest in the land issue. Its potential expertise is in cadastre, registry and survey, but its capacity is quite low. It could be paired with NIMAC in particular.
7. *Forestry Development Authority (FDA)*
   a. Has conducted an impressive forestry concessions review effort, in order to comply with UN timber sanctions.
   b. Has also derived, and received approval for "An Act Adopting the National Forestry Reform Law of 2006".
      - Now working on the regulations to the new law (currently in draft form).
   c. Do they have the needed support to move ahead with implementation and enforcement of the new regulations once approved?
8. *Ministry of Internal Affairs*
   a. Has a large role in local governance in the counties, including land tenure.
   b. There is a 1972 Local Government Law, what is the current status of the law; are there efforts to implement/enforce the law?
   c. What is the current role of the MIA in the land tenure issue, and what can it take on?
   d. The potential role of the MIA is large, but capacity is not high. The MIA is a potentially good partner, and significant component of the rural (local government) land tenure effort.
   e. The MIA could gain in capacity from NIMAC, GRC and university connections.
9. *UNMIL – several units*
   a. Environment, Legal and Judicial, and other units within UNMIL, currently hold considerable amounts of spatial data (satellite imagery, population, infrastructure, etc.), which would be of significant utility to the overall land and property effort.
   b. Efforts should be made to obtain such material and have NIMAC and the Ministries of Lands, Agriculture, the FDA, and the university make use of this valuable resource.
   c. Is there an ability to archive, process, and disseminate such information in the Ministry of Lands (perhaps with NIMAC help)?

10. Local advocacy - NGOs

a. Green Advocates, which is comprised of lawyers, have a keen interest in land tenure issues, especially for smallholders.
b. Green Advocates is currently working with IUCN and a World Bank consultant to derive a legal analysis of relevant legislature.
c. Other NGOs can be of use in a variety of dissemination, monitoring and smallholder assistance issues.

11. Donor community (USAID)

a. Has completed a legal analysis, workshop and report (and probably more) that have discussed a variety of issues on the land and property rights question in the country.
    - Their workshop efforts, in particular, can be seen as part of a larger consultative effort (involving a variety of Liberian and other stakeholders, such as the investment community) and could be built upon.
b. The proceedings of the workshop, and the report, need to be better disseminated.
c. The legal analysis is, in particular, difficult to obtain, but is particularly valuable and needs to be made much more widely available, so as not to duplicate efforts.
d. What do GRC and USAID think that USAID is best positioned on (and interested in) to take the lead on within the broader land issue?
e. USAID could be better linked with GRC to discuss workshop/conference priorities and the consultative process, among other issues.
f. Can other donors besides the World Bank, the UN and USAID be brought into the land tenure set of actors?

ANNEX 1

Institutional map as it relates to land tenure

This annex describes the current institutional constraints and opportunities in Liberia with regard to land tenure. The section focuses primarily on formal institutions, but also mentions important customary institutions. Further work is needed in exploring the postwar character of customary institutions with respect to land tenure and their utility in policy reform.

Formal institutions

Governance Reform Commission (GRC)
The GRC is the lead institution on the land tenure issue in the country. The Chairman is Dr Amos Sawyer, and the commission reports directly to the President. The GRC was initiated under the Accra Peace Accord and has been tasked by the President to move forward with land policy reform. The strengths of this institution are that Dr Sawyer has considerable experience with governance in Liberia (he was President of the country from 1990 to 1994) and with institutional reform (he is codirector of a research and policy centre on political theory and policy analysis, at Indiana University in the United States, which focuses on institutional reform). Dr Sawyer's experience also means that he has numerous contacts on which to call for a wide variety of support. When Dr Sawyer is out of the country Mr David Kailain is acting chairman for day-to-day affairs. The GRC is carrying out reform on a number of issues apart from land and property rights. This includes the related judicial reform, decentralization, and security sector reform.

While the GRC has offices, vehicles and support staff, they are thinly staffed otherwise and are looking for both people and funding for personnel support. At present the staffing issue is dealt with by Liberian and foreign consultants.

Functionally the GRC is to take the lead in policy design and from there the actual law-making is a legislative function. This said, the GRC envisions a "law reform commission" to be proposed in the near future. The GRC also envisions the creation of a "committee on land tenure", which would be a working group that takes the lead on the actual work of policy reform. The committee would exist under the GRC and be comprised of representatives from the Ministry of Lands, Mines, and Energy; the Ministry of Internal Affairs; the Ministry of Agriculture; the Ministry of Justice; the Ministry of Planning, among others. The actual composition of the working group will be decided by the GRC.

Ministry of Land, Mines, and Energy
The GRC and the Ministry of Lands have not yet divided the components of the land issue between them with regard to exactly what responsibilities each will have. While the GRC clearly has the lead on policy and legal reform, it would be logical for the Ministry of Lands to be responsible for elements of cadastering, survey, etc. The Ministry of Lands is intending to constitute a land commission, but it has not yet been determined what the responsibility of the commission will entail.

Institute for Research, University of Liberia
This institute has significant emerging social science research capacity. It is currently being upgraded, with the addition of Dr Jeanette Carter as codirector. Dr Carter is also a consultant

with the GRC, and so constitutes an important link between the GRC, the university and social science research.

Forestry Development Authority (FDA)
This institution was the primary entity working with the international community to fulfil the requirements to get the timber sanctions lifted, and so has higher capacity in comparison with most other institutions. The newly completed Forestry Reform Law was derived and operates through the FDA. As part of the process to lift timber sanctions there was a review of all forestry concessions, with the goal to cancel those not acquired according to legal procedures, and to update, regularize and modify others. The FDA is supported by the Liberia Forestry Initiative.

Ministry of Agriculture (MOA)
The MOA reports considerable disarray in the agricultural lands sector. Very large acreages are still claimed and held via historical transfers of unknown legality and legitimacy. Subsequent transfers have not been recorded, so that currently there is much confusion over who owns what agricultural land. Capacity in the MOA is quite low, and the loss of documents makes their land administration efforts more complicated.

Ministry of Internal Affairs (MIA)
This ministry will deal with land tenure issues from a local government perspective, and so will have a large role to play in land policy reform. The MIA deals with the chiefs and clans, and also has a land commission. The commission is intended to be a land conflict commission, focused on Nimba County first and perhaps others subsequently. The need for this commission, the Minister argues, is great, given that the courts systems in the country is currently clogged and has a problematic history. The Minister will also chair the Boundary Harmonization Commission that UNDP is planning to organize.

The Liberia Agency for Community Empowerment (LACE)
This agency has a local community perspective, and finds that in the process of engaging in local community development they are in the position of needing to deal with land tenure problems, particularly land disputes. Thus they see themselves as dealing with land conflicts in the process of pursuing community development without it being a specific, stated objective.

UNDP – NIMAC
The National Information Management Centre (NIMAC) is a unit within UNDP, and while not a Liberian institution, it is nonetheless mentioned here because of its important current role in mapping, and administrative and legal boundary work. It also has a large potential role in capacity building in these areas within the Ministry of Lands, Mines, and Energy. Directed by an expatriate, the unit is currently working on bringing together the legal documents that attest to the locations of subnational boundaries in the country, both rural and urban. Such an exercise is important to land and property rights administration, cadastre and survey.

Liberian Refugee Repatriation and Resettlement Commission (LRRRC)
This institution provided support for the reintegration (including reportedly land access) of IDPs as long as they were in camps and registered. There is some indication exists of the effectiveness of its programmes and its capacity needs.

Other formal institutions

Additional institutions of interest to land tenure include the Ministry of Planning and Economic Affairs, the National Bar Association, the University Law Department, the Liberian Law Journal and the National Information Centre – who will conduct a census in early 2008 that will include a mapping exercise.

Customary Institutions

Clans

Clans, as a set of local customary institutions, do play a role in land tenure. They played a role in the IDP camps and worked with the LRRRC in reintegration. A (partially) kin-based group, the clan leadership knows the happenings in rural areas intimately, and so would be an asset in land tenure considerations.

Chiefs and chiefdoms

Chiefs assisted with reintegration under the auspices of the LRRRC, and will continue to have significant local authority regarding land issues. Chiefdoms are spatial areas and constitute a boundary and group-level land claim consideration that will need to be incorporated into the broader institutional efforts regarding land tenure. However considerable animosity was generated between chiefs and some senior members of rural communities on the one hand, and the rural youth on the other. There is some concern that reinstituting the chieftaincy in full might lead to problems with reintegration, including land issues.

Poro Societies

In rural areas, Poro Societies can reportedly be of utility for governance issues including land tenure, in some ways. These may include issues of social discipline (enforcement of land tenure decisions) but perhaps not resource allocation, and certainly not in terms of transparency. There is some indication that Poro Society institutional involvements in land conflicts tend to take one side or another, as opposed to operating in a way that objectively resolves such conflicts.

Other customary institutions

There are a variety of customary institutions in postwar Liberia that pertain to specific groups. These are connected to what are referred to as local, informal, micro "rule of law" systems. The extent to which these prove to be positive contributions to postwar land tenure reform or instead create problems or operate more neutrally remains to be seen. Some of these rules of law systems regarding informal forms of land tenure include: squatters, ex-combatants, refugees and IDPs, rural youth, women's groups, specific ethnic groups, religious divisions, etc.

ANNEX 2

References and relevant publications

Allott, A.N. 1967. A report on the feasibility of research into Liberian customary law. *Liberia Law J.,* 3: 83–100.

Association of Female Lawyers of Liberia (AFLL). 2006. *The law to pass down property and rights of people married under both civilized and traditional way made simple.* Association of Female Lawyers of Liberia, Monrovia.

Bentsi-Enchill, K. & Zarr, G.H. 1967. The assurance of land titles and transactions in Liberia. *Liberia Law J.,* 2: 95–121.

Blundell, A.G. 2003. *A new environment for Liberia – a road map for the forest sector.* USAID, Monrovia.

Bruce, J.W. & Migot-Adholla, S.E. 1994. *Searching for land tenure security in Africa*. Dubuque, Iowa: The World Bank and Kendall/Hunt Publishing Co.

Bruce, J.W., Migot-Adholla, S.E. & Atherton, J. 1994. The findings and their policy implications: institutional adaptation or replacement? In *Searching for land tenure security in Africa,* Bruce, J.W. & Migot-Adholla, S.E., eds. Dubuque, Iowa, USA: Kendall/Hunt Publishing.

de Soto, H. 2000. *The mystery of capital: why capitalism triumphs in the west and fails everywhere else*. New York: Basic Books.

FAO. 2006. *Liberia: Forestry Sector Emerges After 14 Years of Conflict And Mismanagement*. Food and Agriculture Organization of the UN, Rome.

Forestry Development Authority (FDA). 2004. *Appendix I: Concession Review Process*. Forestry Development Authority, Government of Liberia, Monrovia.

Forestry Development Authority (FDA). 2006. *FDA draft regulations and contracts*. Forestry Development Authority, Government of Liberia, Monrovia.

Forestry Development Authority (FDA). 2006. *An act adopting the national forestry reform law of 2006*. Forestry Development Authority, Government of Liberia, Monrovia.

Government of Liberia (GOL). 1956. *Public Lands Law*. Liberia Code of Law, Vol III, Government of Liberia, Monrovia.

Government of Liberia (GOL). 1956. *Real Property: instruments affecting or relating to real property; probate and registration*. Liberia Code of Law, Government of Liberia, Monrovia.

Government of Liberia (GOL). 1962. *Natural resources law*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 1972. *Local Government law*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 1986. *Constitution of the Republic of Liberia*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 1987. *Wildlife and National Parks Act*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 2003. *An act for the establishment of the East Nimba Nature Reserve*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 2004. *Millennium development goals report 2004*. Government of Liberia, Monrovia.

Government of Liberia (GOL). 2006. *Liberia statement of policy intent for agriculture*. Ministry of Agriculture, Government of Liberia, Monrovia.

Government of Liberia, Liberians United for Reconciliation and Democracy, Movement for Democracy in Liberia (GoL/LURD/MODEL), 2003. *Liberia Comprehensive Peace Agreement*. Accra, Ghana.

International Crisis Group (ICG) .2004. *Liberia and Sierra Leone: rebuilding failed states*. Crisis Group Africa Report No. 87, Brussels.

IRIN. 2006. **Liberia: idle fighters cause concern**. UN IRIN, Africa.

Kamphuis, B. 2005. Economic policy for building peace. In *Postconflict development: meeting new challenges*, G. Junne & W. Verkoren, eds. Boulder, Colorado, USA: Lynne Rienner.

Marquardt, M., Unruh, J. & Heron, L. 2002a. *Land Policy and Administration: Assessment of the Current Situation and Future Prospects in East Timor, Final Report*. US Agency for International Development, and Government of East Timor, Dili East Timor and Washington D.C.

Marquardt, M., Unruh, J. & Heron, L. 2002b. *Terms of Reference: Study of Land Issues in East Timor*. US Agency for International Development, and Government of East Timor, Dili East Timor and Washington D. C.

Ministry of Foreign Affairs (MOFA). 2003. *An act to govern the devolution of estates and establish rights of inheritance for spouses of both statutory and customary marriages*. Ministry of Foreign Affairs, Monrovia.

Parnall, T. 1967. Adverse possession in Liberia. *Liberia Law J.*, 3: 137–157.**Parnall, T.** 1967 Comments on Liberia's statute of intestate succession. *Liberia Law J*., 3: 15–33.

Platteau, J.P. 1996. The evolutionary theory of land rights as applied to sub-Saharan Africa: a critical assessment. *Develop Change,* 27: 29–86.

Platteau, J.P. 2000. Does Africa need land reform? In *Evolving land rights, policy and tenure in Africa,* Toulmin, T. & Quan, J., eds. pp. 51–74. London: Natural Resources Institute.

Plunkett, M. 2005 Reestablishing the rule of law. In *Postconflict development: meeting new challenges* G. Junne & W. Verkoren, eds., Boulder, Colorado: W. Lynne Rienner.

Quan, J.(2000. Land tenure, economic growth and poverty in sub-Saharan Africa. In *Evolving land rights, policy and tenure in Africa,* Toulmin, T. & Quan, J., eds. pp. 31–50. London: Natural Resources Institute.

Richards, P. (n.d) To fight or to farm? Agrarian dimensions of the Mano River conflicts (Liberia and Sierra Leone). *Afr Affairs*, 104: 571.

Richards, P., Archibald, S., Bruce, B., Modad, W., Mulbah, E., Varpilah, T. & Vincent, J. 2004. *Community cohesion in Liberia: a post-conflict rapid social assessment*. African Knowledge Associates, Monrovia.

Roth, M., Unruh, J. & Barrows, D. 1994. Land registration, tenure security, credit use and investment in the Shabelle region of Somalia. In *Searching for Tenure Security in Africa*. Bruce, J.W., Migot-Adholla, S.E., eds. The World Bank and Kendall\Hunt Publishing.

Sawyer, A. 2005. *Beyond plunder: toward democratic governance in Liberia*. London: Lynne Rienner Publishers.

Toulmin, C., & Quan, J. 2000. *Evolving land rights, policy and tenure in Africa*, London: Natural Resources Institute.

UN Development Programme, Ministry of Planning and Economic Affairs (UNDP/MoPEA). 2006. *National human development report 2006*. UN Development Programme, Ministry of Planning and Economic Affairs, Monrovia.

Unruh, J.D. 1993. Restocking refugee pastoralists in the Horn of Africa. *Disasters,* 17: 305–320.

Unruh, J.D. 1993. Refugee resettlement on the Horn of Africa: the integration of host and refugee land use patterns. *Land Use Policy,* 10: 49–66

Unruh, J.D. 1995. Pastoralist resource use and access in Somalia: a changing context of development, environmental stress, and conflict. In *Disaster and Development on the Horn of Africa*, Sorenson J., ed. London: Macmillan.

Unruh, J.D. 1995. The relationship between indigenous pastoralist resource tenure and state tenure in Somalia. *GeoJourna,l* 36: 19–26.

Unruh, J.D. 1995. Post-conflict recovery of African agriculture: The role of 'critical resource' tenure. *Ambio,* 24: 343–350

Unruh, J.D. 1996. Resource Sharing: small holders and pastoralists in Shalambood, Lower Shabelle Region. In T*he Struggle for Land in Southern Somalia: The War Behind the War,* Besteman, C. & Cassanelli, L., eds. Boulder, Colorado: Westview Press.

Unruh, J.D. 1996. *Land Tenure Conflict Resolution in Mozambique: The Role of Conflict Resolution in Land Policy Reform*. Land Tenure Center, University of Wisconsin–Madison, Madison, WI.

Unruh, J.D. 1997. The role of land conflict and land conflict resolution in a peace process: Mozambique's return to agriculture. *Refuge,* 16: 28–33.

Unruh, J.D. 1998. Land tenure and identity change in postwar Mozambique. *GeoJournal,* 46: 89–99.

Unruh, J.D. 2001. Postwar land dispute resolution: land tenure and the peace process in Mozambique. *Int J World Peace*, 18: 3–30.

Unruh, J.D. 2001. Somali rural property rights: whither the future? *J Anglo-Somali Soc*., 30: 38–39.

Unruh, J.D. 2001. *Land Dispute Resolution in Mozambique: Institutions and Evidence of Agroforestry Technology Adoption*. The Consultative Group on International Agricultural Research (CGIAR), System-Wide Program on Collective Action and Property Rights, Working Paper 12., IFPRI: Washington D.C.

Unruh, J.D. 2002. Local land tenure in the peace process. *Peace Rev.,* 14: 337–342.

Unruh, J.D. 2003. Land tenure and legal pluralism in the peace process. *Peace and Change,* 28: 352–376.

Unruh, J.D. 2004. *Post-conflict land tenure and the sustainable livelihoods approach*. Background paper prepared for the Food and Agriculture Organization of the United Nations. FAO: Rome.

Unruh, J.D. 2004. *Land and Property Rights in the Peace Process*. Intractable Conflict Knowledge Base Project, Conflict Research Consortium, University of Colorado. http://www.beyondintractability.org/m/Land_tenure.jsp.

Unruh, J.D. 2004. Rural property rights in a peace process: lessons from Mozambique. In *WorldMinds: 100 Geographical Perspectives on 100 Problems,* Warf, B., Janelle, D. & Hanson, K., eds. Kluwer.

Unruh, J.D. 2005. Changing conflict resolution institutions in the Ethiopian pastoral commons: the role of armed confrontation in rule-making. *GeoJournal,* 64: 225–237.

Unruh, J.D. 2005. Property restitution laws in a postwar context: the case of Mozambique. *Afr J Legal Studies,* 3: 147–165.

Unruh, J.D. 2006. Land tenure and the 'evidence landscape' in developing countries. *Ann Assoc Am Geog.,* 96: 754–772.

Unruh, J.D. 2005 *Post-conflict land tenure – using a sustainable livelihoods approach*. id21 UK Department for International Development (DFID). www.id21.org.

Unruh, J.D. 2005. *Land tenure and its relationship to food security and investment in postwar Sierra Leone*. Technical paper prepared for the Food and Agriculture Organization of the United Nations. FAO: Rome.

Unruh, J.D. 2006. *Primary issues in post-conflict land and property rights*. Canadian Peacebuilding Coordinating Committee (CPCC), Ottawa, www.peacebuild.ca.

Unruh, J.D., Heynen NC, Hossler P. 2003. The political ecology of recovery from armed conflict: the case of landmines in Mozambique. *Polit Geog.,* 22: 841–861.

Unruh, J.D., Cligget L, Hay R. 2005. Migrant land rights reception and 'clearing to claim' in Sub-Saharan Africa: A deforestation example from southern Zambia. *Nat Resources Forum,* 29: 190–198.

US Agency for International Development, Ministry of Lands Mines and Energy (USAID/MoLME). 2006. *Real estate registration and real property tax practicum workshop*. USAID/MoLME, Monrovia.

USAID/OTI. 2006. *An investigation of the real estate registration and real property tax system in Liberia for USAID/OTI and the Ministry of Lands, Mines and Energy*. USAID/OTI Monrovia.

World Conservation Union (IUCN). 2006. *Rights and resources*. IUCN, Green Advocates concept note – Liberia tenure analysis. IUCN, Monrovia.

ANNEX 3

People met

- David Kailain, Governance Reform Commission, Acting Chair
- Phillip Banks, Governance Reform Commission, Legal Advisor
- Lois Bruthus, Lawyer, President of the Association of Female Lawyers of Liberia
- Jeanette Carter, Co-Director, Institute for Research, University of Liberia
- James Logan, Acting Minister of Agriculture
- Mr. Johnson, Minister, Ministry of Internal Affairs
- Alfred Brownell, Lawyer, Director, Green Advocates (NGO)
- Benedict Ksagbeh, Lawyer, Green Advocates
- Daniel Charles, Lawyer, Green Advocates
- Kieth Jubah, Director, Rubber Planters Association
- Ramses Kumbuyah, Executive Director, Liberian Agency for Community Empowerment LACE)
- John Woods, Managing Director, Forestry Development Authority
- Margret Hall, Management, National Information Management Centre
  Isabelle Marle, INGO Liaison Officer, Management Steering Group of International NGOs in Liberia
- Beverlee Bruce, Development Alternatives International, USAID
- Amos Sawyer, Chair, Governance Reform Commission
- John Nyumah, Deputy Executive Director, Liberia Refugee Rehabilitation and Resettlemnt Commission (LRRRC)
- Mike Dzakuma, Judicial Affairs Officer, Legal and Judicial System Support Division, UNMIL
- Emanuel Faustino, Economic/Governance Cluster Leader, World Bank Liberia
- Johnathan Davis, Agricultural Economist, Forest Sector Management Project, WorldBank
- Luigi Giovine, Country Manager, World Bank Liberia
- Eric Sirleaf, Records Specialist, World Bank Liberia
- Jaime Thomson, Senior Associate, Associates in Rural Development, Burlington VT
- Ramzy Kanaan, Associate for Liberia, Associates in Rural Development, Burlington VT
- Rebecca Gruby, Environmental Law Institute
- Carl Bruch, Environmental Law Institute

III. MECHANIZATION AND POST-HARVEST STUDY

By

Thomas Lovendall
Consultant, FAO

Liberia 2007

III. MECHANIZATION AND POST-HARVEST STUDY

1. INTRODUCTION

A study was carried out on mechanization and post-harvest activities in Liberia as part of the overall Comprehensive Assessment of the Agriculture Sector of the country.

The study was expected to generate appropriate information on the status, potential and constraints of the sector to facilitate decisions on the direction, methodology and scope of actions for the sector to contribute to national priorities of policy development, food security and nutrition, productivity, investment income and employment.

The team that carried out the study included: Lovell Thomas, International Consultant Mechanization &Post-harvest, Franklin Henries, National consultant, Food Crops (Liberia) and Mr. Robert Van Ottertail, Agro-industries, FAO Regional Office for Africa.

2. METHODOLOGY OF THE STUDY

The study was carried out using the following approaches:

- discussion among the team members on the methods to be used to conduct interviews and undertake field visits;
- desk studies of relevant reports and literature on the sub-sectors;
- field visits to key areas of action in a number of counties;
- interviews with officials from the Government of Liberia (GOL), NGOs, private sector businesses and farming communities in various parts of the country;
- assessment of completed projects implemented by NGOs;
- interactions with other team members

The team met with the CAAS-Lib team leader, Dr Spencer, and other national and international consultants in the CAAS-Lib team, Mr T.E.C. Palmer (FAORAF) and Dr Brandy, National Project Coordinator, CAAS-Lib. The purpose was for general introductions among team members, and briefings on the overall methodology of the CAAS-Lib and the format for reporting. The Deputy Minister of Agriculture and Dr Hammond, the FAO Country representative, participated in the introductory meeting.

The team met to prepare the programme of work, indicating the various places to visit and persons to meet in the Monrovia environs during the first week, plus the programme for the field trips. The proposals were discussed with Dr Brandy for organizational arrangements for the team's work. Sample questionnaires were also prepared and discussed with the team leader, Dr Spencer.

The team held meetings with the Minister of Agriculture in his office and attended a meeting of the Agricultural Coordination Committee, during which the team interacted with the NGO community engaged with agricultural delivery.

Meetings were held with the USAID Liberia Community Initiatives (LCIP), who are engaged in providing support for farm machinery for the processing of oil-palm, rice and cassava

through donations to farmers' groups and cooperatives, particularly in Bong and Nimba counties.

The team visited representative areas in the country, particularly Bong and Nimba counties in the central and northern region, Cape Mount and Bomi counties in the west, and the greater Monrovia area. The team could not visit the southeastern areas of the country owing to difficulties in accessing these areas.

The team reviewed the past and ongoing activities in mechanization and post-harvest processing being carried out with the support of projects, and by those farmers who did not have such support. This review covered practices for rice, the main staple food commodity in the country, cassava, oil-palm, fish and vegetables. The team reviewed the situation on processing and packaging of fish, livestock (pigs and bushmeat) and oil-palm. Discussions were held with a variety of persons, including small-scale farmers, farmers in projects, fish-smoking processors, extension workers for the government and NGOs, and individuals involved in various aspects of post-harvest activities.

Discussions were held with importers of farm machinery and hand tools to assess the types and quality of tools and equipment ordered; where they were ordered from; the conditions of import, sale and distribution; the cost of machines and tools. Samples of the machinery and equipment found in various places during the study included an oil-palm mill (costing $2 226), a cassava mill ($2 157), a palm kernel mill and separator ($2 157), a rice mill and engine ($2 910), planters, diggers, hoes, cutlasses, and other tools of various categories. Importers also deal with petrol and diesel engines to power the various mills. They sell the machinery but do not provide installation and training or back-up services. TR Enterprise was found to be the main importer of agricultural equipment and machinery, most of which was imported from the Marketing & Business Development Association in Ghana, which is a group supported by the European Union and the Canadian International Development Agency (CIDA). This Foundation is a technology transfer, training and manufacturing organization that was incorporated in Ghana in 1999.

The team held meetings with the Rubber Planters Association (a local association of rubber producing farmers) for the purpose of obtaining data and information on the mechanization and post-harvest activities involved in production rubber by smallholders or cooperatives. The Association has over 2 000 members with plantations ranging from 15 to 1 000 acres in size.

The team held consultative meetings with PACESL – a local NGO – on blacksmithing activities and the role blacksmiths play in support of farm mechanization. Discussions were also held with individual village blacksmiths on their operations and needs.

The team visited one (Tubmanburg) of the four regional centres established in 2005, with the support of FAO, for the training of metal artisans and blacksmiths, to facilitate the production of agricultural tools and equipment used in food production. The project was also designed to provide cheap and reliable tools for the production of food to the farming community.

The limited duration of the mission in the country did not allow the team to visit other places to obtain a wider level of information on post-harvest and mechanization practices in the country. However, some additional information on the subject was later provided by the national consultant on the team.

This report focuses on findings and results of assessments carried out of the following:

a. cultivation and production methods utilizing the following:
   - mechanical cultivation and Post-harvest handling of rice using high horsepower tractors and associated equipment, and power-tillers and associated equipment;
   - animal draught power;
   - blacksmithery.

b. post-harvest handling and processing of the following:
   - vegetable oils (oil-palm);
   - cassava;
   - fish;
   - vegetables.

3. MECHANIZATION

3.1 Tractorization

3.1.1 Review of past experiences

Before the war, agricultural mechanization in Liberia was practiced on an ad hoc basis, and not as a result of a specific programme of GOL. The practice focused on the following activities: rice production (mainly upland and to some extent lowland), post-harvest processing of crops (rice, maize and cassava), extraction of vegetable oil, particularly oil-palm, and processing of livestock, fish and meat products.

The most common use of mechanical production in agriculture was during rice production, and in particular land preparation on both the uplands and the lowlands. The machines used were mainly tractors (crawlers and wheeled tractors), ploughs, harrows and seeders in the uplands, and power-tillers and caged-wheeled tractors in the lowlands. Land preparation activities were each considered as a project or entity, and were supported by parastatals or semi-autonomous companies linked to GOL or a few NGO, or by Liberian indigenous individuals on a commercial basis. Each activity was considered as a project and was not directly linked to the mainstream Ministry of Agriculture (MOA). Various types of tractor were used in such projects, each type reflecting the country from which the support was being provided at the time, which was different from either the preceding or succeeding sponsoring country or entity. Some of the countries involved included Israel, China and the United States of America.

Four such schemes were carried out in the Bong, Lofa, Grand Cape Mount and Grand Gedeh counties. There was no consistent documented information available at the time of the review that described exactly how these mechanized schemes were operated. It is probable that they were applied to plots of land of an average of 2 000 acres and involved large numbers of farmers, generally in their hundreds and in some cases in their thousands, organized into cooperatives. The schemes were carried out mainly in areas of the country where large tracts of land were not difficult to obtain, and close to settlements. The services rendered by the projects were mainly ploughing and harrowing, operated on a cost recovery basis, with payments made by the farmers at the end of the planting and harvesting season. No documented information was available to make an analysis of the cost-efficiency of these

operations or to determine their comparative advantages against alternative systems of land preparation.

Selected workers, not farmers or beneficiary groups, were trained in repairs, maintenance and operation of the machines. However, farmers participated in the key production operations, particularly broadcasting of rice, weeding, bird scaring and partial harvesting, in areas that combine harvesters could not safely operate. Most of the spare parts used in the machines were imported by the projects and few were obtained from local stores.

Farm mechanization was also carried out by large commercial farmers, many of them Liberians, who could afford the cost of such operations. Many such farms had tractors with tilling implements, and some could even afford the hire of land-clearing equipment, which usually cost around US$150.00–US$350.00 per acre. Smallholders could not afford the hire of such earth-moving machines, and so for the most part engaged the services of chainsaw groups to assist in the felling of large trees after completion of initial underbrushing at a fee of around US$30.00 plus fuel for a day's operations. Operation was initially on a loan basis to be paid back at harvest at an interest rate of 25%.

Along with tractors, large combines were used for harvesting, threshing and bagging paddy rice, again in the selected areas where large tractors were operating. The enterprise provided maintenance and service facilities for the combine harvesters, and the communities were charged for each operation. The schemes were linked to mechanical production of rice operated by varying concerns, contracted by parastatal companies.

3.1.2 Strengths

If properly organized and operated, tractorization offers much greater opportunity for economies of scale in land use and cost-effective use of improved technologies for production of rice, which in turn will attract greater chances for investment by farmers' groups and communities, or by private individuals.

The schemes provided farming communities in the areas of operation with opportunities to galvanize themselves into groups through which consolidated actions could be taken to increase their access to essential inputs such as improved seeds, fertilizers, other agrochemicals, hand tools and equipment. The publicity of these activities attracted extension services to the communities, firstly from the agencies that operated the mechanization practices and secondly from the national Ministry extension services. The schemes also provided opportunities for employment of young people as drivers, mechanics and farm hands.

Mechanical cultivation of rice was a response to the priority GOL and the people of the country were putting on self-sufficiency in the commodity and reducing their reliance on external supplies, especially because the country at the time could not rely on the vast number of smallholdings, each with less than one hectare to meet national requirements for the staple food crop. Although there were few such projects, their outputs did provide a means to increase production of rice to meet national needs in the shortest possible time.

Large numbers of farming communities in the area of these projects participated in the mechanization schemes, because the practice relieved them of the labour-intensive manual preparation of land for upland farming, and the pressures for timely sowing of the crop

before the heavy rains, especially since their farm family labour was decreasing with increasing outmigration of able-bodied young men and women to the urban areas. There were indications that these farmers sought credit from diverse sources just to enable them to pay for the services, demonstrating their commitment to the practice.

3.1.3 Weaknesses

Notwithstanding their apparent strengths, mechanical cultivation, (particularly tractorization) of rice, as carried out at the time, had a number of shortcomings that would have limited their ability to meet the overall objectives of large-scale production of rice in the shortest possible time.

Lack of regulations and proper institutional framework to support mechanization
There was no clear policy from GOL to guide the nature and scope of the application of the practice. More especially, guidance was needed on the prioritization of land areas for the application of such activities, given the geoclimatic conditions of Liberia. The country is heavily forested, receives heavy annual rainfall (1 600–5 000 mm), and has relatively heavy soils, which would have required special management using such heavy machinery. Conditions should have been established for application of the practice, especially participatory development, which would have encouraged direct involvement of the participating farmers, not just for the use of machines but for sustainability of the achievements and environmental protection. More importantly, the schemes should have been used to build viable farmer groups with input/output objectives, such as farmers getting access to inputs and forming a large group for marketing and other economic purposes. There was no obvious unit in the MOA with technical staff qualified to monitor or eventually take over from the expatriate service providers, or to retain an institutional memory for such mechanization operations. Such an institutional arrangement would have been invaluable to collate lessons learned from such practices and to improve on the systems for future actions. For these reasons the achievements of the mechanization activities were not retained after the expiration of the projects.

Inappropriate technologies:
The intensive cultivation of land using heavy machines such as crawlers can have negative effects on soil structure, texture and eventually its fertility, if no proper procedures and guidelines are applied. Extending the practice throughout the country would have compounded the problem. The tractors and implements used for the projects were not standardized, thus promoting different models and therefore different methods of operation, adjustments, repairs and spares. There was no evidence that the machines and equipment used were tested or adapted to the prevailing soil conditions to avoid degradation of the soils. More importantly, there was hardly any evidence that the farmers had the sense of ownership of these machines, mainly because of their negligible financial capacity to purchase, operate and maintain such complex technologies and make profit from them. This was especially true because the primary purpose of the farmers for mechanical cultivation of rice at that time was for consumption rather than marketing. As such, there was a visible dependency on the GOL or other bodies that provided such technologies.

The increase in cultivated acreage created a greater need for weeding, and there was no organized strategy to address the problem. This increased the workload of the women who carried out such operations on the farms, to the detriment of other equally important activities such as the production of short-term crops for sale and supplementary feeding.

Inappropriate government interventions
The schemes were operated by non-governmental entities on an ad hoc commercial basis. The operators of the schemes provided the equipment and expertise with relatively no control from GOL. The MOA had a passive involvement in the schemes, and when they did make an attempt to register control it was mainly on revenue generation, to the detriment of the schemes. The schemes charged at least 25 percent of the harvest of each participating farmer. When the MOA intervened in the schemes, they changed the terms of payment without reference to stakeholders, and decided to charge 75 percent as a land preparation cost – this made people less interested in the operations and resulted in a gradual decrease in participation.

Lack of participation by farmers and communities
The operations were managed and operated by the bodies that introduced the schemes on a cost recovery basis. The high level of skills and technology required to operate the schemes was available mainly through the expatriates brought in by the providers of the schemes. Recipients of the schemes or their representatives did not participate in the planning and management of the operations. Feedback from user satisfaction with the services or cost appropriateness was limited to negligible. There was no clear linkage between service providers and users. Although farmers were organized into cooperatives, the object was mainly to register them for participation in the schemes according to their area of residence and to organize their repayments as set out by the scheme's organizers. When the services were terminated, there was no clear point to restart the process, as sustainability of the practices was not a major consideration when mechanization was being considered as a strategy to increase land preparation and consequently rice production in the country.

The cooperatives established to collaborate with the schemes were not well organized, and could not successfully intervene in setting the costs of operations in order to establish fair charges for their members for using the services offered through the schemes, in establishing capacity-building programmes for their groups to eventually take over the operations, or in ensuring effective output marketing activities of their members.

Lack of cost data
Statistics were not available on the costs of production per unit (tonne or 50 kg bag) for rice under the mechanization schemes, nor under the traditional manual method. There were indications, however, from records of food imports into the country during the period that the cost of a 50 kg bag of imported rice in the 1970s and 1980s averaged US$20, compared with US$28 for that produced under the mechanized schemes. Cost analysis would have given a clearer indication of the reasons for the higher costs under the schemes and how these could have been avoided or improved upon.

3.2 Power-tillers

3.2.1 Past experiences

In the past, power-tillers were used in the swamplands operated by cooperatives, mainly in Bong, Cape Mount, Lofa, Maryland and Nimba counties. The tillers were introduced by the Chinese on bilateral arrangements and were operated under their supervision. The Chinese trained the first generation of operators, who in turn were expected to provide on-the-job training to selected members of the beneficiary communities to allow them to operate and maintain the power-tillers.

There were no service workshops for repair and maintenance of the machines and accessories, nor stores and sheds to protect the equipment from adverse weather conditions. The main constraints were the lack of a continuous supply of spare parts, the unavailability of skilled mechanics for repairs and maintenance and finance to support the cultivation scheme, the untimely availability of seeds and fertilizers, and bad roads.

3.2.2 Strengths

The power-tillers were introduced under a promotional scheme, with the machines provided free of cost to the beneficiaries, except for operational costs. The scheme was gradually becoming popular and sought after by many communities, because the alternatives were mainly labour-intensive manual operations of land preparation and cultivation. Several results became apparent.

- Members of the farming community were trained and had become capable of operating the power-tillers, albeit with some limitations in management.
- There was more cohesion among the communities and groups operating the power-tillers during training and cultivation practices. This was the result of a sensitization process that preceded the operations and the training provided on a group basis.
- More land was brought under cultivation by smallholders and more rice was produced.
- Farmers became very interested and willing to form groups to facilitate purchase, ownership, use and maintenance of such equipment, because the activities were carried out on their lands, closer to their homes and their involvement in everyday management of the operations. In addition, the projects provided inputs and access to markets through groups, which were organized and managed by the participants themselves.
- The costs and maintenance of the machines were being met when farmers operated them at group level, because they were involved in the factors for which the costs were incurred.
- The use of the machines fitted the relatively small sizes of the holdings, and could be easily managed at family level or by small groups.

The practices showed much promise, more for the participatory approaches with which they were introduced, and their ability to be managed by the users.

3.2.3 Weaknesses

There were a number of noticeable shortcomings with the schemes that limited sustainability of the achievements of their application.

User groups were not properly sensitized to ownership and investment in the machines on a continuous basis, nor were needs assessments carried out and appropriate capacity-building programmes prepared and carried out, particularly in management of groups and equipment.

There was inadequate training of the operators in repairs and maintenance, and even management of the enterprises, especially after the departure of the Chinese, who provided such services at the height of the application of the practices. Unfortunately, the MOA were not directly involved in the schemes and provided negligible technical backup services.

Similar to the schemes involving large tractors, the machines were not always appropriate for local conditions. They were Chinese made and imported. Unavailability of adequate spare

parts became problematic because the items were not universal and common to other manufacturers of such products. This problem increased when the Chinese could no longer be contacted after their departure from the country.

Infrastructure problems limited the effectiveness of the schemes. Transportation costs to the production areas for collection of accessory inputs were as high as those paid for carrying outputs from the farms to the markets. This and the bad roads to and from the farms were disincentives for the willing farmers to adopt the practice.

It was apparent that the enterprises that developed from the introduction of power-tillers were not planned for marketing: no proper storage facilities or processing, handling and packaging of the excess produce were constructed or planned for.

3.3 Rice post-harvest processing

This involves both large-scale mechanization schemes using large tractors and combine harvesters and large mills, and small-scale low-technology rice production and processing schemes using power-tillers, motorized threshers and small-scale rice mills.

3.3.1 High technology

3.3.2 Combine harvesters (large scale)

Along with tractors, large Chinese combines were used for harvesting, threshing and bagging of paddy. The mechanization schemes provided maintenance and service facilities for the combines. The services were also extended to the farming community with large acreages of smallholdings. The community was charged for each operation.

3.3.2.1 Strengths

Large areas of land were harvested within a shorter time and losses during harvesting and threshing were reduced. The paddy harvested was immediately bagged, minimizing handling losses and introducing standardized packaging. Farmers participating in the schemes expressed satisfaction with having more time on their hands for other tasks such as trading and vegetable production. There were high opportunities for saving labour.

3.3.2.2 Weaknesses

- High levels of skill were required for operating and maintaining combine harvesters, and these were not available from local experts or technicians.
- The cost of the equipment and its maintenance were high, and not affordable by the communities using them.
- The farmers were incapable of purchasing such equipment, and even if this were possible through group collaboration, they were not prepared to or capable of undertaking maintenance and paying operational costs by themselves.
- The combines were either self-propelled or attached to tractors and could not be used when the engines were faulty. They were heavy and required hard ground to operate effectively. However, not all areas are dry at harvest and prolonging harvesting because of soft ground conditions causes losses.

3.3.3 Rice mills (large scale)

The rice processing equipment used includes large combine harvesters complemented by mills of 1 to 2 tonnes/hour capacity equipped with rubber rolls that produce few broken grains. The processing services are extended to communities without conditions of membership of projects or cooperatives providing the services, with the user paying the charges set by the providers. Milled rice for the project is temporarily stored in silos, bagged in 25 and 50 kg bags, and later transferred to warehouses where it is stored for the market.

3.3.3.1 Strengths

- Large quantities of paddy are milled in one season, with reduced damage to the crop, compared with that which occurs when rice is left in the field and processed manually in very small portions. There is a high recovery rate of milled rice (8–15 percent of grains are damaged). Post-harvest loses due to milling are greatly minimized.
- The availability of such technologies could be used in participatory development, and in encouraging smallholders to operate in groups for economies of scale. The practice reduces labour input, mostly by women, in processing rice using a mortar and pestle.
- Investors can plan their opportunities with reasonable levels of success.

3.3.3.2 Weaknesses

The cost of the milling operation is very high because of high fuel and transportation costs; the cost of maintenance is also high, with high spares costs and few skilled technicians. The operation requires highly skilled operators and the mills cannot be used for small quantities of paddy that are often brought in by small farmers for home consumption. Only farmers with large volumes of paddy can benefit from mechanized milling of rice; for a sustainable scheme, a smaller mill with a capacity of about 250–500 kg/hr can be purchased, operated and maintained by the farming community.

3.4 Low technology

3.4.1 Small-scale rice mills

Processing of rice by the traditional manual method is prevalent in all the areas visited by the team, especially because rice mills are very few and are expensive to hire.

Rice milling activities are gradually increasing in the country. Donor agencies such as USAID and LWS are adding to this development through the provision of milling equipment with capacities of 200 kg/hour to communities, particularly in Bong, Grand Gedeh, Nimba, and Grand Cape Mount counties. Private milling enterprises are also being established, although slowly, and mainly in suburban areas. Alongside the mills are also small-scale multicrop threshers to complement the rice mills. Their output ranges from 500–800 kg/hr and they are powered by 7 hp petrol engines. When properly adjusted, they can be used for maize, sorghum, cowpea and other crops.

The donor agents provided technicians to install and demonstrate the operation of all the equipment, and training to a few members of the community in operating and managing the equipment.

3.4.1.1 Strengths

The introduction of low technology, low cost rice processing equipment fitted the scale and operation of rural farmers. There is an apparent awareness by the farmers of the benefits and responsibilities of owning and using the equipment and the need for their commitment to their responsibilities. The farmers realized that more rice was processed and losses were reduced; the chores of threshing with the feet or sticks and hand pounding were eliminated and more time was available for the women to undertake other activities. The threshers are portable and this enhances threshing in the field on paved drying floors, which minimizes transportation and shredding losses. There was a clear indication of the urgent need for such equipment and willingness by the farmers to participate in the process.

3.4.1.2 Weaknesses

The management and operational training period for the selected members of the communities was too short. The demonstrations to introduce the equipment were not widespread and were carried out in too short a time frame. The donors did not assess the eeds of the farmers that complement the acquisition or operation of the mill and the thresher. Very few, and in some cases no, government extension officers were involved in such schemes because they were provided by NGOs who had their own extension workers posted in the projects. There is no institution that can provide support in management, maintenance, repairs and backup to the scheme. There was and currently is no policy or regulation regarding the implementation of such support activities in the country.

There was little use of drying floors or storage and packaging of the paddy or milled rice after processing. Few drying floors were observed in the places visited. Instead, drying of rice and other crops still occurs on mats and on the ground. Not surprisingly, there were unwanted materials (stones, grit, pieces of glass) among the rice grains.

3.5 Draught animal power

Not much activity was reported using this type of farm power. The few attempts made revealed difficulties in maintaining the animals, especially during the wet season. During the dry season, the land still was too heavy for successful activity. In addition, there is no specific Technology Unit in GOL that could develop, promote and disseminate the activity even if the climatic conditions were favourable.

3.6 Local blacksmithery

3.6.1 Past experiences

Widespread local manufacture of small hand tools and equipment for farming was not evident to the reviewers, which is understandable given the the long period of civil war when the operators became displaced, which may have destroyed the trade. The local blacksmiths shops seen by the team were very rare and not functioning well. There were, however, indications of viable business before the war. The major problems observed were inadequacy of funds to procure the equipment (forge, blower, welding machines, grinders/cutters), the lack of consumable materials, particularly scrap metals, and more importantly the lack of availability of credit to ensure their activity as a business.

PACESL, a relatively large local NGO that was involved with blacksmithing, is no longer operating because of lack of support, apparently from a major donor. Before the war, it had a

grant of US$1 500 to fabricate rakes, cutlasses and small items of equipment such as manual rice threshers and cassava graters. FAO supported a programme in cooperation with PACESL that trained blacksmiths who, after the training, were subcontracted to fabricate agricultural tools, buckets, watering cans, etc. Their biggest constraint at that time was the availability of proper scrap material to reduce the cost of fabrication. All their equipment and machinery was lost during the civil war. They expressed willingness to restart their operations should there be support provided to them.

An FAO TCP/LIR/3003(E) project has provided support to GOL in the past to strengthen the capacities of blacksmiths to enhance production of farm hand tools and equipment for resettlement and building livelihoods. The support was directed at:

- rehabilitating four regional Tool Production Centres;
- training individual blacksmiths to upgrade their knowledge and skills.

A total of 120 trained village blacksmiths (professionals) were used to train 139 ex-combatants (graduates) in the production of various agricultural tools and small items of equipment, including hoes, hammers, rakes, shovels, coal pots, cutlasses, chisels, pick axes, other axes and spades.

At the end of each session, each trainee was provided with a package of tools to enhance their village blacksmith work. The package consists of the following tools:

- one anvil (2 feet long on a rail track);
- two double-faced hammers (4 lbs and 6 lbs);
- one pair of tongs;
- one chisel.

The FAO strategy has been to empower the graduates through awarding of contracts and free access to apprenticeship for volunteer trainees. To this end, 21 000 bells are currently being produced for the integrated pest management initiative of the FAO/MOA. In the past, 15 000 scratching hoes and 1 000 feeders were contracted to the graduates within the four regions. These contracts also served to build the capacity of the blacksmiths and to keep the centres operative.

Another recent development is that the International Labour organization (ILO) is looking at the possibility of engaging some of the graduates in the production of tools for future development purposes.

According to the regional coordinator of blacksmiths (FAO), a national plan to have such training centres in each county is being proposed to FAO and stakeholders to give wider access to blacksmithing technology in Liberia.

3.6.1.1 Strengths of the blacksmithing activities

- Four regional blacksmiths' centres were rehabilitated, in Fendell, Tubmanburg, Voinjama, and Zwedru, and could serve as focal points to develop the trade.
- Village blacksmiths were trained as master trainers who could be used as reference points for extended training of other blacksmiths.

- A large number of trainees from host communities (residents), returnees, and ex-combatants were trained, including women.
- Forty village blacksmiths' workshop facilities were rehabilitated.
- A large quantity of tools and equipment, including two mobile welder/generators (5 kVa) were procured for the programme.
- Many tools were fabricated and sold at the end of the programme. The market orientation of the activity could encourage investment in the trade by the local blacksmiths, as perceived by the regional coordinator of blacksmiths for FAO.
- Contracts were awarded to trained blacksmiths to fabricate scratching hoes, bells and chicken feeders to increase their capacity and sustain their operations.
- The provision of officers to monitor the performance and progress of the programme and to report to FAO and GOL could provide the nucleus for a Unit on Blacksmithery to be established within the MOA.
- At the end of the programme, trainees were provided with a package of tools to help them in their village blacksmith work.

3.6.1.2 Weaknesses

- There was little evidence of sustainability of the achievements of the project, including the fact that there were no immediate plans for the effective use of the training centres and the equipment retained in them after the end of the FAO project. The Tubmanburg training centre, which was rehabilitated under the project, now has no activities, but it has a Chief Trainer employed as a caretaker for the building. The equipment used for the training was in disrepair. This included the two welders and generators, the blowers, fire furnaces and seats for the track anvils. There are samples of the tools fabricated, some of which are left on the floor and a few are shelved in a small store. Some of the tools are rusting because they were not treated with anti-rust compounds and subsequently painted.
- There was little evidence of any assessment of the local blacksmith centres in order to ensure that the tools provided to each trainee would be adequate for the beginning or continuation of effective production of tools at the village level.
- The project is the first of its kind in Liberia and could have been better implemented in phases over the medium term so that lessons learned from the first phase could be used in the next.
- Quality standards were not set for the fabrication of tools and equipment to compete with imported equivalents.

3.6.2 The way forward

The GOL has established among its priorities food security at household and national levels, and to a very great extent import substitution of its key staple food crop, rice, and other staple food commodities such as short-cycle livestock meat and vegetable oils. Mechanization, particularly land preparation for cultivation of cash crops, and production of poultry and swine will no doubt be critical in any strategy for the recovery of agriculture in Liberia in the medium to long term. It is also an important input in the value chain of a number of commodities of urgent importance, particularly the production and processing of rice, maize and selected oil crops (vegetable and fruits). Some important considerations are necessary to ensure the optimum use of best practices.

3.6.2.1 Policy

Mechanical cultivation

Past experience of mechanical cultivation does not appear to give the country a comparative advantage in the achievement of self-sufficiency in the country's staple food commodities of rice, cassava and other cereals through this approach. The costs of operations are higher than those of external markets and appear to be beyond the capacity of the farmers who are expected to be the focus of the production drive. More importantly, there are indications from this study that the farmers themselves will find it difficult to sustain such operations, except with support from GOL or other interested parties. If past experiences are anything to go by, such supported schemes, particularly those involving government, may not be sustainable given the purpose of the mechanization activity, and the relatively low returns on operations.

On the other hand, past and present experiences point to the advantages of using power-tillers in the cultivation of swamps for production of rice and other short-cycle crops. The potential of the swamp resources for multiple cropping within a year has been proven. The intensive cost-effective use of such machines during the year will ensure a positive cost-benefit ratio of the machines, and will in turn increase sustainable productivity of the farmers and their resource areas. In addition, the machines could be easily owned, operated and maintained by farmers themselves. All farmers the team interacted with expressed interest in, and enthusiasm for, such an approach.

Given the strong desire of GOL for self-sufficiency in the production of its staple food crops, rice, cassava and vegetables, and the importance of mechanical cultivation in advancing the process, the key policy options for mechanical agricultural cultivation in the country currently and in the immediate future could be to:

- promote mechanical cultivation for self-sufficiency through the use of small machines, particularly power-tillers, focusing on swamps and lowlands in view of the proven use of the swamps for such purposes;
- strengthen institutional technical support units for sensitization, awareness, and participatory involvement of farmers' groups and communities in the adoption of the technologies;
- encourage the establishment and strengthening of farmers' cooperatives, organizations and groups in the ownership, use, operation, maintenance and repair of the machines, and linkages to various sources of input/output markets (cost recovery technical services, credit, markets, machinery importers, equipment and implement fabricators, etc.);
- encourage interested private sector parties to be involved in mechanical cultivation in the uplands, through:
  - provision of proper technical advice and guidance in the establishment and maintenance of such enterprises, enhancing generation of information and data on the types, models and number of tractors to be utilized, and the areas and lands in the country suitable for mechanical cultivation;
  - inclusion of mechanization in the country's investment code or portfolio of investment opportunities in the country, in view of the interest shown by indigenous Liberians and foreigners in introducing mechanical cultivation to the country;
  - establish a regulatory framework on standardization and pre-testing of tractors and accessories to be supplied and practices to be carried out in the country, essentially to ensure that they are appropriate to the soil and environmental conditions of the country; establish measures that will ensure that spare parts are easily obtained, and

that quicker and cost-effective technical services are provided without detriment to smallholder farmers.

3.6.2.2 Institutional strengthening

The government should, as a matter of urgency and priority, set up in the MOA a small Unit for Mechanization staffed with at least two qualified agricultural engineers and agronomists, mainly to coordinate activities in the sub-sector, monitor them and advise GOL on actions to take. The Unit could undertake a more detailed investigation into the operations of the recent schemes and activities in land preparation and processing in the agriculture sector, so that a much better picture of lessons learned could be obtained. They would also be involved directly in regulatory matters such as charges for operations, evaluation of activities, testing, and adaptation of all machines and equipment for agricultural development.

The Central Agricultural Research Institute (CARI) of Liberia should be involved directly with mechanical cultivation activities for selected crops, primarily to provide advice on seed varieties, and soil and machine relationships.

3.6.2.3 Programming

Because GOL wishes to accelerate the process of agricultural recovery, and particularly food production, at household level, and because mechanization could contribute greatly to such processes and the sustainability of the achievements, the following actions are proposed.

The Government should seek support urgently to undertake a programming exercise mainly to prepare strategies for mechanization in the sector in the short to medium term, paying attention to the following:

- use of power-tillers by small groups at community level, primarily within its proposed National Programme on Food Security, because this programme will focus on food production from lowlands aided with irrigation to ensure production throughout the year;
- establishment of tractorization schemes for mechanical cultivation and processing of selected agricultural commodities.

4. POST-HARVEST HANDLING AND PROCESSING OF VEGETABLE OILS

4.1 Background

Mechanical processing of vegetable oils was not widespread in the country. The activity was limited mainly to processing of oil-palm fruits, which gives the highest yield of oil per unit area of any crop and produces two distinct oils, palm oil and palm kernel oil, both of which are important in world trade. There was some isolated small-scale processing of legumes, groundnuts and some sunflower seeds, mainly by NGO-supported groups and private individual commercial entities. Such activities were too limited and the information on them is too scarce to make a calculated input to the study or to provide a systematic assessment of their comparative advantages.

Approximately 45 percent of agricultural households process palm oil from natural groves. After the civil war, the main methods of oil-palm cultivation and extraction continued to be manual, using local methods. Semi-motorized methods and fully automated plantation

production schemes exist but almost all the machinery and equipment used before the war was destroyed and only a few of the small-scale processing schemes have been restored.

4.2 Oil-palm processing

4.2.1 Manual production process

About 80 percent of farming communities produce oil through the traditional manual process. The process produces oil of a low quality with low efficiency. It has hygiene and sanitation constraints.

After harvest, the fruits are stripped from the bunch and steamed in local 44–50 gallon drums. The fruits are then macerated using wooden mortars and pestles. The mixture of oil, water, kernels and fibre is agitated in a bath of water and boiled. The oil rises and is scooped off.

The procedure is the same for both intermediate and large-scale processors, only varying in the scale and choice of equipment. The oil is usually stored in used drums, used plastic containers or used ordinary bottles of different sizes and sold in litres or according to the size of the containers.

4.2.1.1 Strengths of local manual oil production

- Production is usually carried out at the household level at the family's convenience.
- Labour is cheap and processing is usually done by members of the family or solicited labour from the neighbours and is paid for in kind.
- Training on the job is carried out by other members of the family at no cost.
- Production provides household needs, with surpluses being marketed to boost household incomes.
- The household does not require a loan to own an extraction facility as the equipment involved is cheap and can be obtained locally.

4.2.1.2 Weaknesses of manual production

- Production is done on a small scale mainly for domestic consumption.
- Sanitary and environmental conditions are usually poor.
- Quality and efficiency of production are low.
- Pollution of the environment with effluent is apparent in most production centres.
- Most of the traditionally produced oil varieties are only available during certain seasons of the year, which leads to low market prices at harvest time.

4.2.2 Small scale mechanical oil mills

Small-scale mechanical mills were introduced to the country by NGOs for use by communities and farmers' groups for extraction of vegetable oils, particularly palm oil, groundnut and sunflower oils, in a participatory way. A few individual indigenous entrepreneurs also established similar milling processes on their commercial farms. On average, the outputs of the digester machines are generally about 500–800 kg/hr. They were generally installed close to the community settlements and operated by the providers with some involvement of the beneficiaries.

Small-scale palm oil extraction plants provided by a donor through an NGO, in Bong County for example, comprised:

- a mobile and motorized stripper with an output of 2 tonnes/hr, powered by a diesel engine of 8 hp capacity;
- a palm fruit steamer with a capacity of 693 litres;
- a fruit digester with 800 kg/hr output also powered by a diesel engine of 8 hp capacity;
- two screw presses producing 60 litres each at each press, both manually operated;
- a palm kernel cracker and separator with an output of 500 kg/hr powered by a diesel engine of 8 hp capacity;
- one oil clarifier of 250 litres capacity.

Limited training was provided to selected persons, in groups identified by the NGO or private companies, to operate the machines. The mills provided by NGOs received support from the Cooperative Department of GOL to organize the beneficiaries into cooperative groups. These units provided limited oversight responsibilities to the operations and management of the machines and the associated activities of marketing the products from the mills. These approaches allowed for some level of cost-effective use and management of the mills with positive outputs.

Spares were made available by the agencies that provided the machines, although there were some delays and loss of working time while initiating demonstrations on the newly installed machines and also waiting for the arrival of spares. Nonetheless, the machines were greatly appreciated by the beneficiaries who started building livelihoods around the establishment of such investment in rural areas.

4.2.2.1 Strengths of small-scale oil mills

The small-scale low-cost oil processing machines and equipment suited the capacities of rural farmers; more oil was being produced with the semi-manual method with a reasonable improvement in quality over the traditional method. Hygiene and sanitary problems were minimized and more time was released for women to undertake other activities.

The operation of the mills also created employment opportunities for young people and income improvement for the beneficiaries. The production processes were independent of electrical energy as the machines used diesel fuel, which could be easily obtained, stored and used as needed. Reasonable quantities of spares were available from local stores, and this assisted greatly the maintenance and repair of these machines. The establishment of cooperatives around the mills provided a baseline from which to build up participatory development processes that could underpin the sustainability of such investments.

4.2.2.2 Weaknesses of small-scale oil mills

It was apparent from observations and interviews that a number of organizational and technical shortcomings limited the impact of the schemes provided by small-scale mechanical processing mills. The schemes operated by NGOs were neither adequate in assessment of needs and requirements for communal use and management of the machines, nor in sensitization of the beneficiaries to participatory involvement in such investments, which would have ensured sustainability of the support.

Ownership of the machines was unclear, and the beneficiaries were reluctant to make repayments for the services provided, or to contribute to the maintenance of the machines. The cooperatives established in support of the mills were also not well organized and their management was unable to produce the desired cooperation from their members, giving the impression that they were only established for the convenience of obtaining a basis for concessions on the lands and casual labour for the mills.

Government interventions in these activities did not go beyond being informed of and taking note of the establishment and operation of the schemes and the supply of the machines to the communities. It also organized the communities into cooperatives for collaboration with the investing agencies. There were no technical backup visits from the MOA for monitoring, advice or input into the management of the operations, mainly because of the very weak institutional capacity that existed in the MOA for post-harvest or agro-industrial activities in the country.

Other shortcomings and institutional inadequacies included the lack of policy measures to underpin the importance and operation of such activities; the failure to establish technical units to provide guidance, technical backup, monitoring and regulation of the safety and quality of accessories and products; information outreach on the success of the schemes and the need for participatory involvement in such mechanization activities were almost non-existent or were badly organized.

The design of the milling units did not make adequate provision for the output of the produce in the community, or for the storage and packaging of the products after processing or the effective utilization of all the different by-products. The review team was informed that buyers of the oil products had to bring containers with them, which indicated a lack of standardization of packaging, and an inadequate level of safety and hygienic conditions to ensure the quality and safety of products for their final destination and use. Milling operations had to be stopped or interrupted to await disposal of the processed oil, because of the lack of storage facilities.

The communities/beneficiaries had no input into the choice of the equipment and machines used, or into whether they were appropriate for the scale of operation or economically justified.

Generally, the housing of the mills was too small and the quality of the ancillary equipment not proven; the material used in sections of the mill could not be verified by independent experts as being of sufficiently high quality to meet hygiene and sanitation standards.

The donors did not have a checklist to ensure that the mills were utilized effectively, nor did they provide a management strategy for the replacement of the mills at the end of their depreciation period; this includes backup services.

Storage and packaging of the oil after processing were not included in the design of the support, nor was proper training on the quality of the material required for processing to ensure a quality product.

4.2.3 Large-scale mechanical oil mills

Large-scale mechanical oil-palm processing was largely carried out in the 1970s, before the civil war, by large establishments controlled by parastatals including the Liberia Palm Products Corporation (LPPC), the Liberia Produce Marketing Corporation (LPMC) and government-owned enterprises including the Butaw Oil Palm Company (BOPC) and the Decoris Oil Palm Corporation (DOPC). Donor governments and their agencies, particularly USAID, also provided support to communities in mechanical processing of oil-palm, albeit for relatively smaller plants. The total production from mechanical processing was estimated at 25 000 tonnes *per annum*, which was above the national requirements, then estimated at about 20 000 tonnes.

Large-scale processing activities were carried out in areas of large plantations of more than 1 000 acres in selected parts of the country, including Bong, Bomi, Nimba and Sinoe counties. Although the companies operated the mills, cooperatives were formed from the communities in the areas of the plantations to manage the plantations and provide a stock of workers to provide labour for running the plants.

Butaw Oil Palm Company in Sinoe and Maryland counties operated one of the largest oil-palm plantations in the country, producing approximately 550 gallons of palm oil per day during the pre-war years. Unfortunately, because of the protracted civil war, the mill has long been closed and the palm trees are now too old to provide oil on an economic basis and therefore need replacement.

These large plants were managed and serviced by expatriates and a limited number of indigenous Liberians trained in selected areas for operating them. There was no indication of involvement of the cooperatives of communities in the management of the mills. Rather, the communities provided manual labour for harvesting and transporting the fruits to and residues from the mills, and casual labour for packaging the products for distribution to the marketing agents. Cracking the kernels was also mechanized for the production of palm kernel oil and cakes, which were both exported as very little of the oil is consumed in Liberia.

4.2.3.1 Strengths

Much larger quantities of oil were apparently produced by these large processing establishments, exclusively for industrial purposes. Although detailed information on their performance was not available, there were indications that the activities provided many opportunities for employment for skilled, semi-skilled and non-skilled Liberians. Communities also participated in maintaining the plantations from which the palm fruits were obtained.

The companies and entities that operated these establishments also provided basic social services such as health centres, schools, transport, electricity and water supplies, free medical care, subsidized housing on the estate and even rice for the workers and communities in the immediate vicinity of the plantations, particularly those closest to the processing plants.

The impact of such opportunities was noticeable in the rural areas near these establishments, as they served as a nucleus for rural development, and attracted the development of many other services and businesses in those areas. Unsubstantiated reports indicate also that the opportunities for employment from these establishments reduced outmigration from the rural

areas, and supported a more organized rural administration of those areas with linkages to central government in Monrovia.

Other strengths of these establishments included the use of mechanization to exploit the comparative advantages of the country for production of tree and industrial crops, increasing value added in the value chain of commodities such as leguminous oil crops and sugar cane, and producing raw materials for the manufacture of items such as soap, margarines and cooking oils that were produced from the outputs of the mechanized processing activities.

The extraction rate of the machines was reported to be between 95 and 100 percent, compared with 50–60 percent for the small-scale manual or semi-mechanical equipment. The differences in performance reflect the high level of organized management that went into the mills from the large establishment, compared with that of the smaller mills and enterprises.

4.2.3.2 Weaknesses

The large milling establishments acquired large acreages of peasant lands for the plantations by leasehold for very long periods of time (30–90) years, with little or no involvement of the people or compensation paid to them, except for payment of royalties to local authorities, which apparently did not filter down to the majority of the people.

The communities were not directly involved in the management nor were they offered shares in the businesses, which would have at least ensured some level of commitment of the people to the continuation and security of the enterprises.

The presence of the mills in these rural areas with the promise of quick income from wages, and the campaign by the companies for supply of raw materials to operate the mills, led to initial cooperation of the communities with the NGOs and companies and allowed large areas to be planted with the crop. However, some of the mills did not have the capacity to handle the large volumes of harvested fruits, including those sold to the companies by the community outgrowers. This latter group could neither find outlets for their products nor smaller mills to process the unsold fruits. The lack of marketing strategies for these surplus fruits led the communities to engage in premature tapping of the palm trees for the production of local wine, which of course led to loss of quality and production of the fruit. Confidence in the establishment of the mills began to fall and agitation regarding the continued tenancy of the establishments started to rise, which led to disruption of operations, and in some cases to vandalization of the installations.

As the processing activities progressed in some areas more land was cleared within the concession areas. This increased deforestation, adding to the growing cost and scarcity of forest products such as bushmeat (game), medicinal plants and wood.

Agrochemicals used to boost palm yields and control pests and weeds, especially in the large plantations, had a visible polluting effect on the environment. The production chains of the processing plants were closely interlinked, or rather interdependent, to the extent that the breakdown of one link impaired the progress of the whole process, and caused costly delays (downtime) first to repair and then to restart operations.

4.2.4 The way forward

The introduction of mechanical processing of oils was conceptually appropriate to Liberia's objectives of self-sufficiency in staple food commodities and diversification of its exports base, as it is now. A necessary strategic input is the use of the agriculture sector to generate other important socio-economic benefits, such as employment, income, agro-industrial growth and export earnings.

This policy objective is still valid to the country in the present situation and medium term, in view of the high priority GOL has placed on self-sufficiency, food security at the household level and competitivity in the production of the staple food commodities of the country. However, from the strengths and weaknesses of both large- and small-scale processing activities, as observed during the review, a number of lessons have been learned on the design, implementation, management and linkages of such activities within the sector and the economy as a whole.

Some of these lessons will set the road map for the immediate future of such activities in the country currently and in the medium term. The most important among them are listed below.

- Manual processing is inefficient and has high labour input and low output. The war has reduced considerably the availability and opportunities for using such sources of farm power. In addition, the cost of employing the scarce available labour will be much higher and render the activity not cost effective.
- Semi-mechanical processing schemes could be owned and operated by small groups. They can produce outputs far higher than manual operations run by individual farm families; they could be cost effective and offer promise for investment and expansion, in view of their potential to ensure sustainable supplies to much larger communities.
- Large-scale processing mills could be strong sources of growth for the economy, offer strong opportunities for employment and foreign exchange, and give opportunities for smallholders to increase employment and income from outgrower arrangements.

The country currently needs the sub-sector to contribute meaningfully to its priority objectives of food security at household level, by the availability of rice, employment, foreign exchange and income. In view of the past experience in the sub-sectors, and the very low capacity of the country currently to invest in such activities; the way forward could be selected from among the options given below.

4.2.5 Policy options

Small-scale processing

- Accelerate the transition from traditional processing to highly efficient semi-mechanical processing over the next five to ten years, essentially to eliminate manual labour, increase efficiency and productivity of the limited labour available in the production areas, increase productivity in outputs per unit, increase capacity for investment by the increased number of participants to take advantage of the opportunities for income, increase the opportunities for employment, and ensure larger numbers of competitive markets in the country.

- Facilitate the establishment or strengthening of producers' groups, associations and cooperatives, and increase or strengthen their linkages to input/output markets, particularly credit and finance, markets and technical services.
- Promote private-sector agribusinesses – both small and large scale initiatives.

Large-scale processing

- Review the operations of selected large-scale processing enterprises established during the pre-war era, such as the Eutaw Oil Company and the Decors Oil Palm Company, for reactivating and rehabilitation. Review the agreements establishing such companies, particularly to ensure the involvement of communities in their activities; promote linkages between large companies and small-scale producers in order to increase the outlet markets of the small producers.
- Promote the establishment of outgrower plantations.
- Provide an enabling environment for value addition, development of new products and increasing competitiveness of products.
- Establish within the country's investment framework and code a priority list of commodities for mechanical processing and for which investment would be needed; include participatory involvement in the establishment of such activities, particularly in rural areas and on communal lands.
- In collaboration with relevant institutions involved with land tenure, administration and use, set guidelines for the acquisition, tenure and use of lands relating to plantations that will produce raw materials for such processes (oil-palm, vegetable oils, etc.).
- Promote joint ventures and other appropriate partnerships in such processing activities and make environmental protection assessments a condition for embarking on such ventures.
- Organize policy dialogues with interested investors present and past, on possible arrangements and incentives for establishing processing activities in the country and rehabilitating existing plants.

5. POST-HARVEST HANDLING AND PROCESSING OF CASSAVA

5.1 Introduction

Cassava is largely a subsistence crop, which is cultivated throughout the country and is particularly important during the hunger season just prior to the rice harvest. To over 80 percent of the population, cassava is the closest substitute for rice as the main staple food commodity. The crop has excellent drought resistance and is adaptable to low soil fertility conditions. Its production requires a low level of technology and it adapts well in the field. High-yielding mosaic-resistant varieties to be cultivated for different purposes had been bred and distributed by the country's main research station, the Central Agricultural Research Institute (CARI). Cassava is a perishable crop that deteriorates rapidly after harvest. The major current constraint on the expansion of the crop is its post-harvest handling, particularly storage and marketing.

5.1.1 Cassava processing

Cassava is generally processed manually to produce fufu (cassava dough), dumboi (pounded boiled cassava), gari and starch. Gari is the most widely marketed commodity because of its longer shelf life. There are no efficient storage methods to maintain the quality of the freshly harvested crop for a number of days; therefore it is processed almost immediately in order to increase its value and provide a stable state for prolonged storage.

Manual processing methods for cassava have remained unchanged prior to and after the war; they are laborious, tedious, slow and mostly done in unsatisfactory conditions. The advent of improved high-yielding varieties of cassava and planting methods led to increased production. Production became more sustainable when farming communities were joined into cooperatives, which made resources for labour and finance more affordable and could be consolidated in increasing production. With increased production, manual processing could not cope, therefore better options had to be identified.

The foot pedal grater was one of the acceptable options, especially in villages without electricity, mostly because children liked playing with it and in the process provided labour. Unfortunately, it could not cope because of its limited and interrupted output. This led to the development of motorized processors powered preferably by diesel engines, which were also useful in villages without electricity. The motorized processors gradually replaced the manual process because they can be operated for long hours continuously.

Mechanized processing of cassava became popular during the emergency postwar period when donor agencies provided such equipment as part of their support of emergency food production, and particularly to produce gari. Because of its longer shelf life gari could contribute to accelerated food security at household levels, particularly in the camps for displaced persons. The most common motorized equipment used has a capacity of 1000 kg/hr (of cassava tubers), and is driven by an 8 hp diesel engine. Provision of such equipment was accompanied by training of selected members of community beneficiaries in the operation and management of the equipment. There was, however, very little evidence of communities buying the equipment themselves from their own resources.

5.1.2 Strengths

Mechanized processing of cassava has generated tremendous interest among communities throughout the country, mainly because of the following:

- the technology processes 10–12 times more cassava (1 000 kg/hr) than the manual practice (40–60 kg/hr);
- considerable savings are made on manual labour for more productive alternative uses;
- much cleaner (grit free) and better quality products are produced and these are accepted by the general public;
- the technologies currently in use are user-friendly and affordable, and are being used to mobilize community and cooperative activities at communal levels, especially to build up economies of scale for growing and marketing the crop;
- the processing machines fit the capacities of rural farmers and they appear to be happy to own and operate such technologies.

5.1.3 Weaknesses

Use of cassava processing equipment for gari is not widespread in the country, and from the limited operations that have been carried out in the country through projects, donors and NGOs, a number of weaknesses have been observed.

- The management and operational training period for the selected members of the communities/beneficiaries and the demonstrations of the operations of the equipment appeared too short, and many of the operators have had difficulties managing the equipment, especially in avoiding breakdowns and repairing the equipment when such breakdowns occur.
- Assessment of needs for the beneficiaries was limited or not carried out, especially to ensure ownership and sustainability by the users and owners, and complementarity of their contributions to such support.
- Government technical offices were not directly involved in such activities to provide follow-up technical backup, nor was the technical unit for post-harvest and processing in the MOA strong enough technically and operationally to follow up on such activities.
- There was no policy or regulation to guide post-harvest activities in such rapidly perishable crops.
- The communities/beneficiaries had no choice in the equipment and machines used, and could not ascertain whether they were appropriate for the circumstances.
- The housing of the equipment was too small, and the quality of the ancillary equipment and the material used in sections of the mill could not be verified by independent experts as being of sufficiently high quality to meet hygiene and sanitation standards.
- There was no provision of equipment components for roasting and de-watering of the products, or for milling, sieving and drying of the dough.
- The cooperatives set up around the equipment were not well organized and their management was too poor to take meaningful responsibility for sensitization and mobilization of resources for further group work.
- The lack of proper storage and packaging facilities for the products reduced significantly the quality and quantity of products for the markets.
- There was inefficient utilization of the cassava leaves for human consumption in the diasporas, the peel from the tubers for animal feeds and the starch for industrial or domestic purposes, all of which could have added income to the enterprises.

5.2 The way forward

5.2.1 Policy options

In the light of the government's established priority of food self-sufficiency in its staple food commodities and because cassava is the second most important food crop in the country, the supplies of its products are a major consideration in the short to medium term. The current manual production of cassava products cannot be sustained against the increasing demands for supplies. Mechanized processing of the crop will have to be fully considered as the way forward for the crop. Such a decision will have to be underpinned by a very clear demonstration of GOL's commitment to promoting mechanical processing of cassava, since such an activity, although widely known in the country, has not been practiced or established as such.

The policy options, therefore, for cassava should focus on the following:

- promotion of mechanized processing of cassava at small-scale community and group levels countrywide for a specified period of time. This activity will aim at supporting the drive to food security at household level, creating opportunities for income and employment at community levels and widening the base for supplies of cassava products countrywide, and to larger processing and manufacturing interests;
- creating an enabling environment for large-scale private sector mechanical processing of cassava to improve the value chain of the crop, particularly processing of cassava for high-value products such as cassava flour, composite flours, chips, starch, etc.

A number of actions could be taken to make these policy options operational. First, GOL has sought assistance from FAO to rehabilitate cassava multiplication in the country. This may be the nucleus action required to establish a national programme on the crop, from which various strategies could be developed for various purposes, including small-scale and large-scale processes for specific products.

Second, GOL should in the shortest possible time frame request assistance to undertake a detailed value chain analysis on the crop; this will provide valuable information on recent developments on the crop, in particular:

- guiding the actions of CARI on the Institute's intended research on the crop;
- guiding the actions of development partners and NGOs on the multiplication of cultivars of the crop to determine priorities among the purposes for cultivation of the crop;
- identifying the opportunities for investment in any of the components of the value chain of the crop.

6. POST-CATCH HANDLING AND PROCESSING OF FISH

6.1 Background

Liberia has an Atlantic coastline of approximately 570 km, with a continental shelf averaging 34 km in width; it affords an area of about 20 000 km^2 of fishing ground that extends to 200 nautical miles. The fisheries sector is important for the following reasons:

- Liberia's continental shelf abounds with various species of edible fish;
- over 10 000 people are employed in the industry;
- it is a potential source of foreign exchange (tuna, shrimps, lobsters, etc. abound in both freshwater and marine waters).

The national fisheries comprise three main components:

- marine fisheries, involving industrial and artisanal activities;
- inland fishery, mainly artisanal;
- aquaculture, through fish farming, which is limited in scope and investment.

Techniques for post-catch handling and processing of fish used both before the war and currently include smoking in *chokor* and kilns, salting and drying by artisanal fish workers, while freezing is used by industrial entities.

6.2 Review of past experiences

Smoking of fish is a major occupation of women. The process involves the use of metallic drums of varying sizes from 2 to 8 ft in diameter. About 12 percent of the drums are of the smaller type made from 55 gallon drums. Two 55 gallon drums each split into two parts can be joined together by wires to constitute a medium-sized container. The larger size, which is made from thick and stronger culvert plates 8 to 10 ft wide, is the preferred choice of the majority of the women but it is expensive.

The improved method of smoking using clay mud bricks was introduced by the Ghanaian fishing community mainly in Magibi, located in Marshall City, an old base for the training of sailors that was founded in 1835. A smoking oven made from clay mud, known as a "chorkor", utilizes the heat and smoke more effectively and lasts much longer than the drum type. It is gradually being adopted in Robersport.

Fish for smoking are symmetrically arranged over a mat of bamboo canes or a circular wire mesh separated by thin bamboo canes, supported by three or four wooden sticks (2 to 3 inches in diameter), crossed beneath to support the load of each circular mesh of wire. In most areas, the sticks are being replaced by thin iron rods because of the fire hazard. Successive layers of fish are spread one on top of the other depending on the size of the drum. Large drums can take six to ten layers. The final layer is then covered with either metal sheets or jute bags to retain the smoke and heat. Fire is slowly introduced beneath the drum or clay drum and the fish are dried and smoked. After several hours, the order of the layers is reversed and the fish at the bottom are placed at the top to achieve even drying and smoking.

The smaller ovens of 2 to 4 ft in diameter usually take three to six layers of fish; each layer contains approximately 18 to 24 kg of fish. The larger ovens have six to eight layers and can hold about 40 to 60 kg of fish per layer. The ovens are also used to store fish after smoking, when the quantity can be increased.

The metallic drums often rust, especially at the bottom where contact is made with salty water. They are often unpainted and therefore become weak at the bottom and may collapse when loaded.

The smoking houses are generally made from mud blocks or heavy ventilated sheets of metal. The roofs are made from various materials ranging from thatch, tarpaulin and jute bags to zinc sheets. Some houses are open and can only be used in dry spells.

Fish is smoked on a daily basis according to the catch but imported fish obtained from cold stores is also smoked, depending on market demands. Fuelwood is the main source of energy used for smoking and drying and is brought by boats from the mangrove swamps. Fuelwood is scarce and expensive. It is sold at L$25 (US$0.43) per bunch of four pieces about 2.5 ft long. A pile of wood between two sticks about 6ft high and 1.5ft apart is known as a "core" and sells for L$150 (US$2.60).

The volume of fuelwood consumed in smoking is very large. The depletion of vegetation due to fish smoking can be clearly seen along the route to Marshall City. The land is becoming bare and the only vegetation consists of low shrubs and grassland.

6.2.1 Storage

Before the war, there were many cold storage facilities owned by fishing companies and private businessmen. Currently, few cold stores with large holding capacities (4–25 tonnes) for various types of imported fish, meat and poultry products are available in the fishing areas, and they are owned by private businessmen. The artisanal catch from local fishermen is also stored at a cost, as indicated in the Table 1.

6.2.2 Strengths

- The quantity and sizes of smoking drums for each fishing family is increasing, indicating an increase in the volume of catch.
- The "chorkor" or clay oven has been recognized to increase the effective use of wood energy and improve the quality of the product. It is gradually being accepted and is used by many women.
- Handling and smoking activities are increasingly being carried out close to the sea ports where the catches are landed, with advantages of proximity to seawater for cleaning purposes.
- Mangrove wood, the main source of fuel, is in the vicinity of the smoking areas, reducing transportation costs of the wood.

Table 1

Types and prices of frozen fish sold at a cold store in Robertsport

(24-tonne container with three freezers)

Type of fish	Weight of package (kg)	Cost (L$)
Sardine	30	1 750
Zipper	10	2 150
Bonie	20	1 250
Bonie	30	1 800
Snapper	20	1 600
Pojoe	20	1 100
Jacob	20	1 350
Silver	27	450
Mixed	27	1 350
Fresh fish	20	900

6.2.3 Weaknesses

- Access to credit was and is very difficult for fish traders who want to expand or improve their operations to accomplish their objectives, and when available it is mostly from businessmen whose repayment conditions are harsh to the debtors.
- The lack of appropriate infrastructure for processing (smoking houses are dilapidated with damaged roofs, and are exposed to rain, dust, insects, flies and fire).
- Handling, storage, distribution, packaging and transportation facilities are very limited, and relatively expensive when available.
- The lack of chilled or frozen facilities on board the trawlers and canoes to maintain the quality of the catch throughout the fishing operation.
- The lack of cooperatives among the fishermen and the fish processors to seek and protect the interests of participants.

- The absence of regulations or policies ensuring quality and safety of fish products, which in turn would create greater access to high-value markets within the country and the subregion.
- The extensive use of fuelwood as the main source of energy without the replacement of trees, thus depleting the environment.
- Bad roads leading to the fishing villages.
- The lack of appropriate cutting tools and work benches, especially for the processing of big catches.
- The absence of electricity, which limits cold storage and prevents effective smoking after dusk.
- The absence of a standard weight or measure for selling fish, which would automatically lead to standardized packaging and resultant fixed prices.
- The poor sanitary and environmental conditions of the processing centres lead to low quality produce that does not meet international standards as a result of inefficient processing equipments and technology.

6.3 The way forward

The post-catch/harvest losses in small-scale fisheries in Liberia can be among the highest for all the food commodities in the entire food production chain in the country. The inefficiencies of the prevailing post-catch handling, processing, preservation, storage, packaging and transportation practices are major contributory factors. Other contributory factors include ineffective formation and management of farmers' cooperatives, lack of training of women, who are exclusively the fish processors and the preponderance of inadequately designed and maintained fish smoking houses. Improvement of the situation of post-catch/harvest of fish in the country will no doubt have a measurable impact on food security and nutrition at the household levels, on the income of women who predominate in the industry and on widening the opportunities for employment for the wide range of supporting labour (labourers, traders, marketers, etc.). The action must, however, focus on small-scale artisanal fisheries, which provide over 60% of the fish products for the country, because the industrial fisheries are already highly mechanized with high levels of efficiency in post-catch operations.

In view of the identified weaknesses of the small-scale fisheries, the way forward therefore can be considered to include the actions listed below.

- Mobilize support and establish appropriate infrastructural facilities for handling and storage of fish by small-scale users, on a cost-recovery basis.
- Mobilize resources to provide, on a cost-recovery basis, appropriate infrastructure and improved equipment for smoking fish by small-scale users.
- Encourage private sector interests and create an enabling environment for investment in infrastructure and equipment for packaging and distribution of processed fish.
- Facilitate the establishment or strengthening of producers' groups, associations and cooperatives, and increase or strengthen their linkages to input/output markets, particularly credit and finance, markets and technical services.

Some of the strategies that could accompany the policy options include those listed below.

- Mobilize support to establish a fish harbour with large buildings for marketing of incoming catches with standardized weights or packaging, cold stores, marketing outlets and pricing regimes that could spin-off to other local markets in the vicinity.
- Establish inter-relationships with other sectors, particularly forestry for the wood energy on which processing is dependent.
- Enhance cooperatives in order to enhance community participatory activities for development programmes. Such groups will also facilitate data generation and processing with regard to the volume of daily catches and the quantities processed, marketed and stored, etc., which is almost always lacking, especially for planning and programming purposes.
- Train fish smokers and handlers to manage their cooperatives, applying new improved technologies for reducing spoilage and for handling, preservation, packaging, transporting and marketing of their produce. Special training should be provided in the use of weights and measures in the metric system.
- New improved technologies for reducing spoilage, and for smoking, handling, preservation, transporting and marketing are developed from time to time and the transfer of such technologies will raise the competitive level of the products significantly, targeting subregional and other high-value markets.
- Improve smoking houses. The current structures housing the fish smoking ovens are dilapidated, with unpaved floors and limited ventilation; they are dirty and prone to fire, flies and insects. The structures are small in capacity and the ovens are crowded and not well spaced. Appropriate structures should be provided with improved clay ovens and equipment such as weighing scales, workbenches, cutting and packaging tools and adequate water supply and storing facilities.

7. POST-HARVEST HANDLING AND PROCESSING OF VEGETABLES AND FRUIT

7.1 Background

Vegetables are a major component of the crops produced in the country. They include okra, bitter ball, pepper, tomatoes, potatoes, cassava, amaranths greens, cabbage, spinach and lettuce. All of these are produced mainly for home consumption, and are also sold in local markets or from street market stalls. A few other vegetables are produced as exotic crops mainly for the supermarkets and high income residents in the urban areas. They include cucumbers, cabbages, carrots, tomatoes, leaf and shallot onions and sweet peppers. The major fruits produced include mangoes, pawpaw, bananas, oranges, avocado pears and pineapples, and apples, peaches, berries are among the common imported fruits.

Although no specific vegetable producing centre was visited, visits were made to a few markets to investigate the extent of the following:

- the production and marketing of fruits and vegetables;
- the handling/marketing of fruits and vegetables with special attention to partial storage, display/presentation of commodities, prices, packaging, processing, etc.
- structures of market buildings and environmental conditions;
- the role of government and other officials in the operations of the traders.

7.1.1 Production and marketing of vegetables

The large quantities of vegetables and fruits observed in the markets are mostly produced from the surrounding villages and conveyed by trucks or vans to urban areas, particularly Monrovia, the capital. Others are produced around the swampy periphery of the city.

Some vegetables are sold at the farmgate and others through traders; still others are taken to and sold in markets by producer groups, essentially to maximize profit. Producers are responsible for the movement of the produce to the farmgate. This is usually done by head portage mostly provided by members of the producer's household and/or farm labourers. Traders can either buy from the farmgate or send appropriate vehicles to pick up the produce from the farmgate after making payment arrangements for the produce.

7.1.2 Handling and processing methods

Vegetables are separated into staples and exotic commodities for marketing purposes; the exotic vegetables .such as lettuce, cabbage, carrots, cucumbers, collard greens, red peppers and string beans are usually sold on a table by a single owner, while staple vegetables (leaves and fruits) are likely to be owned by different people and handled separately. Some staple leaf vegetables require additional handling, either cutting into smaller pieces (potato/sorrel leaves) or grinding/pounding (cassava leaves) for improved texture or added value. There are no additional charges for this extra handling or processing activity, as it is usually undertaken to secure more customers.

The non-leaf vegetables such as okra, pepper, tomato, onions, and eggplant are retailed by traditional measures such as in baskets and bowls, in which the quantities are often falsified by filling the bottom of the container with leaves, grass or earth. To further hide the deceit, the trader often adds a small quantity of the produce as gift after concluding the sale. Sales are packaged and delivered in plastic bags, and black plastics are often used because they conceal the product.

Of the numerous varieties of fruit observed in the market, mangoes seem to be in abundance, because the fruit grows successfully in the wild under various soil conditions in the country. Locally produced fruits are sold based on their size and the level of bruising and maturity in the common markets. Apples are among the few imported fruits sold mostly in supermarkets or by street venders.

Fruits are generally displayed in ungraded trays or bowls of various shapes and sizes based on their demand. They are not wrapped but most often open to contaminated environmental conditions of heat, dust and rain, a condition which reduces the quality and affects the general appearance and taste of the fruit. In such conditions, fruit is exposed to attack by insects, flies and micro-organisms, etc. Fruits were observed to have no standardized packaging; they are usually sold in plastic containers.

Various locally accepted methods of measurement of weight by which horticultural produce is retailed have been identified (e.g. the use of heaps or bunches, in bowls, buckets or baskets, or pre-packaged and tied in plastic bags). There are no standardized methods of measurement of produce or commodities, such as using scales for measuring weights, except for meat and in some cases fish. The price setting process is not fully understood by buyers and sellers alike, and is a major question for consideration in improving marketing of such commodities. Retailers have a dislike of scales but the consumers prefer them at all times.

7.1.3 The structure of market buildings and environmental conditions

Market houses are usually designed with tall roofs and a peripheral wall of about 4–6 ft in height. The floor area is well paved and spacious to accommodate as many traders as possible. Therefore, during a time of plenty, it becomes overcrowded with all sorts of produce. It is not uncommon therefore to see vegetables being sold alongside other produce such as fish and meat, which attract flies when left in the open.

Regrettably, the area between the peripheral wall and the roof is generally open, leaving all market produce unprotected from dust, flies, insects and sometimes rain. The stalls for packing and display of produce are provided by traders themselves; therefore they are not standardized nor are they packed uniformly to reduce congestion, which appears to be the norm. Traders with their produce in single bowls or trays set their produce at the entrance to attract the attention of the entering customers. The market is further congested with trading mothers who bring along their children because they do not have helpers to care for them if left behind.

Trading is usually carried out outside the market, especially when the markets are congested and when it is not raining. This situation encourages littering of plastics, damaged produce and papers. Boxes for waste disposal are limited and are not emptied in a timely fashion. There are no toilet facilities allocated for use by the market community, thereby creating an environmentally hazardous situation.

7.1.4 The role of government officials and other bodies

The traders are aware that the government provided their market facilities and that they in turn have to pay taxes. The formal and legal roles of cleaning, taxing, upgrading and rehabilitating the markets lies in the hands of government officials such as sanitary health inspectors, Ministry of Health officials, Environmental Protection Agency staff, the Liberian Marketing Association, the City Corporation and the local government administration staff. Irrespective of all the controls from these bodies, some traders lament the poor and unhygienic environmental conditions of their markets, especially during the rainy season. In contrast their perception and opinion of the roles of the informal traditional administrator are reportedly very familiar and positive, particularly the collection of market taxes.

7.1.5 Strengths

- There is a coordinated produce marketing link from the farmgate through retailers to the consumer at the city markets.
- Despite the absence of a formal distinction of allocated places for the traders, few commodities are sold in selected areas, which enhances information dissemination amongst traders with the same commodities, and promotes growth and cooperation.

7.1.6 Weaknesses

- There is an absence of regulation with regard to the provision of partitions between the various types of produce to be sold in each market, and the limited capacity of market places observed.
- The market buildings were constructed with limited consideration for formal services and facilities (banks, schools, pharmacies, daycare centres, water, etc.), facilities for sanitation and hygiene, and environmental controls.

- There is an absence of standardized stalls for different commodities.
- There is a lack of strong government implementation agencies for to monitoring of hygiene, sanitation and other health and safety regulations.
- There is a lack of standard weights and measures/packaging for sale of commodities.
- There is a lack of efficient processing and storage methods and fruit processing plants for effective utilization of excess fruits which would prevent large quantities of wastage and add value to the commodities.

7.2 The way forward

Vegetables constitute a significant composite of the food basket of Liberia, and as such are a major consideration for food security in the country. The sub-sector provides a potential opportunity to meet GOL's key objectives of food security and nutrition at the household level, employment, income and investment (in processing). For the next 2–3 years the focus of action could be on productivity and competitiveness in view of the use of the commodities as staples, the fairly large quantities of exotic vegetables that are imported from neighbouring countries, and the country's apparent comparative advantage in land and water for producing the commodities.

Post-harvest losses in vegetables are relatively high but the nature and scope of this has not been systematically assessed. Based on observations, however, there are inefficiencies in the prevailing practices of handling, processing, preservation, storage, packaging and transportation that should be addressed.

Vegetable and fruit production, like fish processing, is occupational and gender biased and can contribute to employment, income and increased nutrition at household level. It should therefore be recognized as a very important commodity and it deserves effective support for sustainable growth.

7.2.1 Policy issues

In view of the above, policy measures for improvement of horticultural commodities should focus on ensuring availability, quality and affordability. This will require that action be taken to improve handling, processing, and packaging of vegetables and fruits. Policy options should focus on the following:

- mobilizing support and establishing appropriate infrastructural facilities, particularly specialized market structures for handling and storage of vegetables and fruits by small-scale producers, on a cost-recovery basis;
- mobilizing resources to provide, on a cost-recovery basis, appropriate infrastructure and improved equipment for preservation of vegetables and fruits by small-scale producers;
- encouraging private sector interests and creating an enabling environment for investment in infrastructure and equipment for packaging and distribution of vegetables and fruits.

These policy measures could be accompanied by a number of strategies, listed below.

- Organization of vegetable growers and processors into cooperatives to increase participatory levels in development programmes. The cooperatives will also facilitate data generation and processing with regard to quantities produced, processed, marketed and stored.

- Training producers and handlers to manage their cooperatives; applying new improved technologies for reducing spoilage, handling, preservation, packaging, transport and marketing of their produce. Special training should be provided in the use of weights and measures in the metric system for different types of produce.
- Establishment of roles and responsibilities of the public and private sectors in the monitoring of hygiene, sanitation and other health and safety regulations. Grounds around the market centres must be free from improperly stored equipment; litter, waste or refuse; excessively dusty roads; inadequately drained areas with potential for foot-borne contamination or breeding places for insects or micro-organisms.
- The construction and design of the market should provide sufficient space for hygienic arrangement of equipment and storage of materials; floors, walls and ceilings must be constructed so that they are cleanable and they must be kept clean and in good repair; any operations that may cause cross-contamination of food products with undesirable microorganisms, chemicals, filth or other extraneous material should be separated by partition, location, time or other means; provide effective screening or other protection to keep out birds, animals and vermin such as insects and rodents. Provide adequate ventilation to prevent contamination of foods with odours, noxious fumes or vapours.
- For medium- to long-term actions, establish dialogues with entrepreneurs interested in investing in fruit processing and related industries.

A well planned fruit and vegetable processing centre that is designed to operate for as many months of the year as possible is required. This means that the facilities, the buildings, the material handling and the equipment itself must be inter-linked and coordinated properly to allow as many products as possible to be handled at the same time, and yet the equipment must be sufficiently versatile to be able to handle many products without major alterations (See Box 1).

Box 1: A typical fruit and vegetable processing centre

A typical processing centre or factory should process four or five types of fruit harvested at different times of the year and two or three vegetables. This processing unit must also be capable of handling dried/dehydrated finished products, juices, pickles, tomato juice, ketchup and paste, jams, jellies and marmalades and semi-processed fruit products.

There are three types of processing systems: small, intermediate and large. Historically, however, small- and intermediate-scale processing has proved to be more successful than large-scale processing in developing countries.

Small-scale processing is done by small-scale farmers for personal subsistence or for sale in nearby markets. In this system, processing requires little investment; however, it is time consuming and tedious. Until recently, small-scale processing satisfied the needs of rural and urban populations. However, with the rising rates of population and urbanization growth and their more diversified food demands, there is need for more processed and different types of food. The most appropriate type is the intermediate scale of processing.

With intermediate-scale processing, a group of small-scale processors or cooperatives pool their resources. This can also be done by individuals. Processing is based on the technology used by small-scale processors with differences in the type and capacity of equipment used. The raw materials are usually grown by the processors themselves or are purchased on contract from other farmers. These operations are usually located on the production site in order to assure raw material availability and reduce the cost of transport. This system of processing can provide quantities of processed products to urban areas.

REFERENCES

Adum Banso. 1990. *BOPP (Benso Oil Palm Plantation). An analysis of the palm sector's problems*. Mimeo.

Alexandratos. 1995 *World agriculture: Towards 2010, An FAO Study*. Food and Agriculture Organization of the United Nations. Rome.

Alverson, D.L., Freeeberg, M.H., Pope, J.G. & Murawski, S.A. 1994. *A global assessment of fisheries bycatch and discards*. FAO Fisheries Technical Paper, 339: 233.

Ames, G.R. 1992. The kinds and levels of post-harvest losses in African inland fisheries. In *Proceedings symposium: post-harvest fish technology,* Teutscher, F., ed., Cairo, October 1990 FAO CIFA Technical Paper 19.

Amiruddin, M. N., & Ahmad, I. 1984. Prospects for palm oil in the Middle East and selected African countries. In *Proceedings of the international seminar on market development for palm oil products,* Y. Basiron and K. G. Berger, eds, pp. 131–9. Kuala Lumpur.

Anwar, M. 1981. *Current and prospective situations of the oil palm/palm oil industry.* Palm Oil Research Institute of Malaysia, Occasional Paper No. 1. Kuala Lumpur.

Baffoe-Bonnie E. & Quansah, C. 1975 *The effect of tillage on soil and water loss.* University of Science and Technology, Kumasi, Ghana.

Benneh, G. & Gyasi, E.A. 1991. *Home gardens in West Africa: Progress in research role in agricultural production, nutrition, income generation and constraints to realizing their full potential as a sustainable agroforestry system.* Paper presented at UNU/INRA Programme Consultative Meeting, University of Ghana, Legon, 22 26 April 1991.

Clucas, I. 1997. *A study of the options for utilization of bycatch and discards from marine capture fisheries*. FAO Fisheries Circular, FIIU/C928.

Clucas, I. & Teutscher, F. (eds). 1999. *Report and Proceedings of the FAO/DFID Expert Consultation on Bycatch Utilization in Tropical Fisheries*, Beijing, China, 21-23 September 1998.

Colin, D. 1992. Recent trends in fruit and vegetable processing. *Food Sci Tech Today*, 7 (2): 111–116.

Development and Sustainable Environment, 16–21 November, Sao Paulo. Tholey-Theley, Germany: International Federation of Organic Farming Movements, pp. 233 238.

FAO. *Emergency Assistance for the Training of Artisans and Blacksmiths in Liberia*. TCP/LIR/3003 (E).

FAO. 1984. *Land Food and People.* Rome: FAO.

FAO. *Fruit and vegetable processing by Mircea Enachescu Dauthy*. Consultant Services Bulletin no. 119.

FAO. 1986b. *Prevention of post-harvest food losses*. Rome: FAO.

FAO. 1990a. *Rural processing and preserving techniques for fruits and vegetables*. Rome: FAO

FAO. 1991. *Sustainable Agriculture and Rural Development*. Regional Document no. I, FAO/Netherlands Conference on Agriculture and the Environment: Strategies and Tools for Sustainable Agriculture and Rural Development, S-Hertogenbosch, the Netherlands, 15-19 April, 1991. Rome: FAO.

FAO. 1994. *Agricultural mechanization strategy for Ghana* FAO Agricultural Engineering Service, AGSE, Rome.

FAO. 1995a. *Farm power, an essential input for crop production* FAO, Agricultural Engineering Service, AGSE. Rome.

FAO. 1995b. *Tillage systems in the tropics, Management options and sustainability implications.* FAO Soils Bulletin 71.

FAO. 2001. *Fishery country profile – The Republic Of Liberia.* FID/CP/LBR, November, 2001.

Faulkner, O. T., & Lewis, C.J. 1923. Native methods of preparing palm oil. II. *Nigeria: Second Annual Bulletin of the Agricultural Department,* 3–10.

Kaul, R.N. 1991. Agricultural mechanization in Africa - An overview of main issues In Mrema, G.C., ed., pp. 29–42.

Kuala Lumpur. 1992. *Food uses of palm oil.*

Kiple, K.F. & Ornelas, K.C. The *Cambridge world history of food – Oil palm.*

Lahsen Ababouch. *Fisheries and Aquaculture Issues: Food Security*.

Mrema, G.C. 1996. *Agricultural development in Sub Saharan Africa: An engineer's perspective*. Paper presented at a regional workshop on agricultural mechanization in Africa organized by FARMESA, Arusha, Tanzania, and 30th September to 1st October 1996.

Nwanze, S.C. 1965. Semi-commercial scale palm oil processing. *Proceedings of oil palm conference at Tropical Products Institute,* pp. 63-6. London.

Pascoe, S. 1997. *Bycatch management and the economics of discarding.* FAO Fisheries Technical Paper, 370.

Teutscher, F. (ed.) 1995. *Utilization of bycatch from shrimp trawlers*. Report and proceedings of a TCDC workshop on the utilization of bycatch from shrimp trawlers, Nosy-Be, Madagascar 6–8 June 1995.

Thompson, A.K. 1989. *Recent advances in post-harvest technology of fresh fruits and vegetables*. Cranfield Institute of Technology, Silsoe College, UK.

University of Ghana. 1991. *The oil palm industry and its implications for the rural economy in Ghana*. Unpublished study funded by the University of Ghana, Department of Geography and Resource Development, Legon.

Van der Meijden. 1994. *Soil tillage with tractors in a small village in the Gambia, a broad study on various consequences of soil tillage with tractors, concentrating on soil and water conservation*. Thesis, Wageningen Agricultural University, Soil Tillage Department. Wageningen, the Netherlands.

Ward, A.R. & Jeffries, D.J. 2000. *A manual for assessing post-harvest fisheries losses*. NRI, UK.

World Bank. 1984. *Liberia Agriculture Sector Review Vol.1: Main Report.* No. 4200-Lbr. April 20, 1984.

INVESTMENT PROPOSALS

CAAS-Lib – Investment proposal for: Promotion of small-scale mechanized extraction of vegetable oils (palm oil and legumes) and processing of cassava

Name of activity (project?)	Small-scale mechanized extraction of vegetable oils (palm oil and legumes) and processing of cassava.
Institutional responsibility	Farmers' groups/organizations, NGOs, MOA
Objectives of the activity	1. Widespread mechanized extraction of vegetable oils and processing of cassava countrywide. 2. Small- to medium-scale farmers' groups and cooperatives directly involved in and managing activities of mechanized processing of oils and cassava. 3. Large quantities of quality vegetable oils and cassava products being produced from small- to medium-scale mechanized processes in the country, and utilized in the country. 4. Measurable increase in employment and incomes of rural communities in agro-industrial activities, particularly women and young people.
Description of main activities	1. Situation assessment: identification of target groups and communities; needs and requirements for promoting mechanized processing of agricultural commodities for food security, employment and income of small producers. 2. Establish organizational arrangements for the project; plan of work, timetable and responsibilities to carry out activities of the project, etc. 3. Procure and distribute equipment and machines; establish and carry out demonstration and management arrangements. 4. Establish the post-harvest losses and sanitation problems involved in the processing of the crops indicating methods of prevention or minimizing them. 5. Assist target groups/communities to comply with quality control measures; marketing and distribution outlets. 6. Strengthen MOA and other institutions for advice, quality control, training in management of enterprises and monitoring of activities. 7. Assist beneficiaries to establish linkages with other support sources.
Expected result(s)	1. Noticeably increased availability of locally produced vegetable oils and cassava products affordable countrywide; greater consumption/intake of such commodities with increased nutritional levels of the people. 2. Increased levels of production of the selected commodities with the corresponding processing of the commodities. 3. Noticeable increase in incomes of the producers, employment of people in the processing enterprises and increased interest in, and investment by, rural people, particularly women and other private sector interests in various segments of the value chain of the selected commodities.
Impact on food security, poverty reduction & economic development	1. There will be a measurable increase in nutritional levels of people, food security at household levels, increased livelihood and incomes, particularly in rural areas. 2. A significant percentage of women will find gainful employment and increased incomes in various aspects of the value chain of the selected commodities (production, preparation for processing, marketing, product development, etc.). 3. Significant numbers of young people will be employed in the enterprises, particularly in the operation of the mills and marketing of products. 4. The establishment of cooperatives around the mills will provide a baseline from which to build up participatory development processes that could underpin sustainability of such investments. 5. The climate for large-scale investment in the value chains of the selected commodities (product development, manufacturing, export, etc.) will have increased significantly.
Period of execution	5–8 years
Estimated cost	US$2.6 million

Inputs

INPUTS – Oil palm, cassava and groundnut processing	**Budget (US$)**
20 Units and accessories for processing oil palm@ US$30 000/unit	600 000
20 Units and accessories for processing vegetable oils @US$20 000/unit	400 000
30 Units and accessories for processing cassava @US$20 000/unit	600 000
Building construction and infrastructure	350 000
Training and demonstration	150 000
Materials and supplies	100 000
Vehicles and accessories	120 000
Technical services, travel,	250 000
General operating expenses and support costs	80 000
Total	**2 600 000**

Estimates of cost of equipment for oil-palm (factory costs valid to December 2006)

Item	**Description**	**Qty**	**Total cost US$**	**Lister* diesel 8 hp**	**15% spares**	**Total US$**
1	Stripper-1t/hr mobile	1	1 854	618	370	2 842
2	Steamer – 500 kg/batch	1	1 685	-	-	1 685
3	Digester – 800 kg/hr	1	753	618	205	1 576
4	Single press – 60 litres	2	2 472	-	-	2 472
5	Clarifier – 250 litres	1	1 045	-	-	1 045
6	Nut cracker and winnower	1	562	618	177	1 357
7	Palm-kernel oil expeller(400 kg/hr)	1	2 921	618	530	4 070
8	Tractor – 28 hp & trailer**	1	3 890	-	583	4 474
9	Water tank and accessories*	2	620	-	-	620
10	Garbage manual push truck – 1.9m^3	2	1 080	-	-	1 080
					total	**21 221**

*The use of the same Lister engine for all machines enhances training, operation and maintenance.
**Transport system in the form of a small-scale 28 hp tractor/trailer also used to pull the stripper through the plantation farm. This facilitates collection and transportation of fruit to the site and finished produce.
***The need for water cannot be overemphasized.

Estimates of cost of equipment for cassava

Item	**Description**	**Qty**	**Total cost US$**	**Lister diesel 8 hp**	**15% spares**	**Total US$**
1	Chipping machine – litre/hr	1	449	618	160	1 227
2	Cassava grater –1 litre/hr	1	607	618	184	1 309
3	Double screw press	2	1 056			1 056
4	Cassava mash/gari sifter – 350kg/hr	2	360	618	147	1 125
5	Bagging stand – 100kg	10	450	-	-	450
6	Fermentation rack – 250–500kg/hr	2	270			270
7	Aluminium pans – 5 kg/batch	10	560			560
8	Aluminium tray (610x1220 mm)	10	2 810			2 810
9	Burnt bricks/clay, hearth for 5 pans	2	786			786
10	Mild steel tray (10x1220 mm)	10	2 470			2 470
9	Water tank and accessories	2	620	-	-	620
10	Garbage manual push truck – 1.9m^3	2	1 080	-	-	1 080
8	Tractor – 28 hp & trailer	1	3 890	-	583	4 474
					total	**18 235**

Estimates of cost of equipment for groundnuts

Item	Description	Qty	Total cost US$	Lister diesel 8 hp	15% spares	Total US$
1	Mechanized groundnut cracker/separator – 250 kg/hr	1	1 434	618		
2	Rotating drum roaster – manually operated – 30kg/batch (45 min. processing) – 40 kg/hr.	5	1 240			
3	Groundnut paste kneader – 30 kg/batch processing for 45 minutes	1	843	618		
9	Water tank and accessories	1	310	-	-	310
10	Garbage manual push truck – 1.9m^3	1	540	-	-	540
8	Tractor – 28 hp & trailer	1	3 890	-	583	4 474
					total	**18 235**

CAAS-Lib – Investment proposal to strengthen the capacities of blacksmiths for agricultural production

Name of activity (project?)	Strengthening blacksmithery capacities for production of small-scale tools and equipment for increased agricultural production and productivity of smallholders
Institutional responsibility	FAO, GOL and the local blacksmith networks at county level; NGOs
Objectives of the activity	1. Well structured Blacksmith Centres (at least four), established at regional level, functional and operational, and producing common and much-used small agricultural hand tools and equipment for small- to medium-scale producers and processors; providing training and advice to blacksmiths at local level. 2. Blacksmiths in counties in each of the four regions are being trained and facilitated in maintenance and repair of the tools and equipment being produced by the Centres and encouraged to produce other tools in their respective areas. 3. Strengthened institutional framework/environment in small- to medium-scale tools and equipment (government; private sector) to ensure sustainability of the capacities built, quality control of tools and equipment; availability of and access to the products.
Description of main activities	1. Four regional Blacksmith Centres set up previously by government, but currently in various states of disrepair will be assessed for rehabilitation, production of agricultural tools and equipment, training and product development. 2. Identification, selection and recruitment of experienced blacksmiths and engineers to manage the Centres and carry out their activities. 3. Establishing a programme for the rehabilitation of the Centres including work plans and activities to be carried out in the short and medium terms. 4. Setting up the organizational arrangements for the management and operation of the Centres, and the start-up of preparations. 5. Procuring, installing and testing of the machines, tools and equipment of the Blacksmiths Centres. 6. Assisting the organization of networks of blacksmiths, other support services (particularly distributors, farmers' groups and NGOs) in the counties under each region; sensitizing and training them on their commitment and responsibilities in regard to the project. 7. Establishing linkages between the project beneficiaries and financial services, particularly savings and credit schemes.

Expected result(s)	1. The four regional Blacksmith Centres rehabilitated and functioning, ensuring continuous availability and increased access to essential production inputs, particularly tools and equipment, for small- to medium-scale producers. 2. Large quantities of small tools, in the range of cutlasses, hoes and rakes, are available and being fabricated appropriately to suit the local standards thus eliminating the modification of newly acquired tools and equipments for the same purpose. 3. Locally made cheaper tools and equipments with spare parts will be available in the country and access to repairs available through local blacksmiths working individually or in cooperatives. 4. Agricultural tools and equipment will have been standardized, quality control established and both will be enforced. 5. The country will have established a capacity through the equipped production centres to undertake contracts for mass production of simple agricultural tools and equipment.
Impact on food security, poverty reduction & economic development	1. Over 90 percent of food produced in the country is from smallholders, and one of their major constraints is inadequacy of farm power, particularly tools and equipment. A successful implementation of the project will increase access to such inputs significantly. This will result in a significant increase in production and productivity, and a corresponding increase in food security in the country, particularly at household level. 2. There will be a noticeable reduction in imported tools and equipment, widespread availability and affordability of locally produced tools and equipment because of lower costs of the items and their appropriateness to the users, and greater activity, which will increase employment and income. 3. The small-scale agro-based equipment necessary in the processing and product development of basic commodities such as rice, cassava, oil seeds/fruits, fish and poultry can be easily serviced by the centre and encouraged to thrive within the local communities, increasing incomes, employment and consequently reducing poverty in the rural areas.
Period of execution	3–5 years
Estimated cost	US$4.58 million

Inputs	**Budget (US$)**
1. Rehabilitation of four Blacksmith Centres	4 000 000
2. Training and demonstration of technicians to manage the four Centres	100 000
3. Equipment and vehicles	100 000
4. Training of blacksmiths' cooperatives	30 000
5. Various technical services and travel	300 000
6. General operating expenses and support costs	50 000
TOTAL	**4 580 000**

CAAS-Lib. – Investment proposal for mechanized farming in food and cash crops

Name of activity (project?)	Promoting mechanized farming in food and cash crops (upland) for increased production and productivity
Institutional responsibility	Farmers' associations/groups, cooperatives; private sector agricultural enterprises; MOA
Objectives of the activity	The project will focus mainly on promoting mechanization to improve specific segments of the value chain (production and processing), of selected crops (cereals, legumes, tubers) and will be directed at small- to medium-scale producers. The project will be designed in two components: • Strengthening the capacities of selected existing commercial agricultural enterprises as nucleus entities in promoting mechanized farming involving small producers. • Assistance will be provided to community agricultural groups/cooperatives to practice sustainable mechanized farming. **In component 1** • Selected enterprises will be fully engaged in sustainable mechanized farming, linked to markets and directly involved with small- to medium-scale producers. • Outgrowers' schemes involving small-scale producers with direct linkages to selected commercial farms will be receiving and providing services for mechanized farming. **In component 2** • Small- to medium-scale farmers' groups/cooperatives will be fully engaged in mechanized farming activities in various parts of the country, with linkages to a number of support services (financial and technical services, distributors/suppliers, market outlets, development support agencies).
Description of main activities	**Component 1** • Select existing commercial enterprises to be used as nucleus entities, and provide on a cost-recovery basis capital inputs (selected machines and equipment) and technical support services; facilitate them to obtain other inputs (from funding and support sources) relevant to mechanized farming of the selected commodities. • Organizational arrangements established for linkages and ongoing activities between the commercial enterprises and input/output markets (credit, equipment, research and extension agencies; partnerships, south–south cooperation). • Technical units including research services established at regional or county levels to provide cost recovery services in advice, maintenance, repairs and management of equipment, machines and enterprises. • The establishment of centres in strategic areas fully equipped for training of tractor operators, mechanics/apprentices, bench fitters, vulcanizers and a mobile workshop vehicle for the service, operation, repairs and maintenance of the tractors and equipments. **Component 2** • Undertake feasibility studies to identify farmers' groups involved and their needs and requirements for mechanized production of food and cash crops. • Provide assistance in establishing promotional hire purchase schemes for obtaining capital inputs for mechanized farming. • Assist in the establishment of support services centres or service groups for the training in management of the enterprises, and cost recovery support for repairs, service and maintenance of equipment and machines. • Assist in establishing linkages between beneficiaries, support services and development partners for mobilizing resources to build up enterprises.

Expected result(s)	1. The project will bring out the opportunities that tractorization offers, especially economies of scale in land use and cost-effective use of improved technologies for production of crops, which in turn will attract greater opportunities for investment at group levels. 2. Farming communities in the areas of operation will be organizing themselves into groups through which consolidated actions could be taken to increase their access to essential inputs such as improved seeds, fertilizers, other agrochemicals, hand tools and equipment; the publicity of these activities will attract cost-recovery polyvalent extension services to the communities, firstly from the agencies that operate the mechanization practices and secondly from the national Ministry extension Services. There will be much greater opportunities than before for employment of young people as drivers, mechanical engineers, agronomists and farm hands. 3. Mechanical cultivation of crops, particularly rice, will have produced large quantities of the crop to the extent that the priority of GOL and the people for self-sufficiency in the commodity will be met and seen to be reducing reliance on external supplies, and meeting national requirements in a much shorter time. 4. Large numbers of farming communities in the area of the projects will be relieved of the labour-intensive practices of land preparation, sowing and harvesting, increasing the opportunities for their labour and time.
Impact on food security, poverty reduction & economic development	1. Increased production with correspondingly increased supplies of locally produced food commodities, with increased affordability and increase in the nutritional levels of the people. The impact will be noticeable in the rural areas where poverty and malnutrition are currently predominant, and income and employment, apart from subsistence farming, almost negligible. 2. Outmigration from the rural areas will slow down, and with the presence of more people the development of rural areas will increase at a much faster rate.
Period of execution	5–10 years
Estimated cost	US$4.5 million

Inputs – 1 centre with 10 tractors	**Budget (US$)**
1. Equipment and machinery with implements (at least 100 tractors and accessories)	1 500 000
2. Processing equipment, vehicles and accessories	1 000 000
3. Support services centres	600 000
3. Infrastructure (buildings, storage, roads, drying floors, etc.)	1 000 000
4. Training	80 000
5. Various technical services, travel	250 000
6. General operating expenses and support costs	70 000
TOTAL	**4 500 000**

CAAS-Lib – Investment proposal for reduction of post-harvest losses of fish

Name of activity (project?)	Reduction of post-harvest losses of fish and improvement of quality through handling and processing technologies
Institutional responsibility	Non-governmental organizations in collaboration with GOL and the fish farmers' cooperatives
Objectives of the activity	1. Women, communities and other agents involved with the post-catch handling of fish possess improved capacities for handling, processing, preservation, storage and marketing of fish products. 2. New improved technologies and support services for reducing spoilage, and for handling, preservation, packaging and marketing of fish products are introduced and being used by women and other agents involved in fish products. 3. Improved institutional capacities are established in the country and providing technical, advisory and other support services to fisheries post-catch activities.
Description of main activities	1. Identify participating groups; their needs and requirements for improved post-catch activities in fisheries; carry out sensitization and training programmes for the management of post-catch fish groups and cooperatives in the use of improved technologies to reduce fish post-catch losses. 2. Prepare appropriate programme of work plans and timetable of activities for the project; initiate implementation including: construction of equipped market houses, storage, processing and smoking houses and clay ovens. 3. Assess capacities and provide appropriate support to strengthen the fisheries subunit in MOA and other support institutions (NGOs etc) for advice, training, monitoring, quality control and regulation. 4. Establish guidelines and regulations for post-catch handling and marketing of fish. 5. Undertake feasibility studies of the value chain within the commodity. 6. Establish linkages between the beneficiary groups of the project and support sources including financial services (credit and savings), packaging agents, exporters, etc.
Expected result(s)	1. Women and other groups involved in post catch handling of fish are operating at organised levels of their enterprises, applying improved methods in their business with a corresponding increase in the quality and quantity of fish being supplied in the country. 2. Much greater availability of fish in the country at affordable levels, with a corresponding increase in the intake of the commodity and nutritional level of the people. 3. More women and youths are gainfully employed in the industry in most aspects of processing, marketing and distribution of fish in the country. 4. Losses in post catch handling of fish are significantly reduced with a corresponding increase in returns to the enterprises of the women groups and agents operating in the industry.
Impact on food security, poverty reduction & economic development	1. Fish being the cheapest form of protein in the country, the activities of the project will contribute measurably to increased intake of fish, and therefore increased levels of nutrition, food security at household level and increased livelihood and incomes. 2. New improved technologies will be used in smoking, handling, preservation, transporting and marketing, raising the competitive level of the products significantly, and targeting external markets, particularly subregional and other international high-value markets. 3. A high level of employment opportunities for young people and women will be available and the prospects for increased income will have been established, all of which attract increased investment in other segments of the value chain of fish products in the country. 4. The establishment of cooperatives provides a baseline from which to build up participatory development processes that could underpin sustainability of such investments.
Period of execution	5 years
Estimated cost	US$3.53 million

Inputs – Fish production processes – three sites	**Budget (US$)**
1. Building and infrastructure	1 500 000
2.Equipment and machinery	1 200 000
3. Vehicles and accessories	80 000
4. Training	150 000
5. Technical services, travel	400 000
6. General operating expenses and support costs	200 000
Total	**3 530 000**

Inputs in one site.

1. A large building (80x60 ft) equipped with aluminium-dressed work benches, knives, scales.
2. Ten smoke houses (60x40 ft) equipped with chorkor clay ovens and ancillaries (bowls, trays, cartons, scales, gloves, benches, etc).
3. Two cold storage containers (each 4 tonnes).

CAAS-LIB investment proposal for development of lowlands

Name of activity (project?)	**Promoting use of small-scale machines and equipment for sustainable productivity of lowlands**
Institutional responsibility	MOA; Chinese bilateral Assistance Agency; farmers' organizations and cooperatives; NGOs
Objectives of the activity **Description of main activities**	• Widespread use of improved sustainable technologies (intensive mechanical cultivation) of lowlands for food production (rice and vegetables) operated by farmers' cooperatives, groups and communities through use of small-scale mechanised farm power. • Introduction and sustainable use of low-cost mechanized technologies for value addition, operated by small- and medium scale-producers. • Widespread awareness of the benefits and responsibilities of owning, using, and managing for profit small- to medium-scale mechanized equipment for agricultural production and productivity. • A special unit established in the division of engineering and construction in MOA, with decentralized operational subunits in regional locations/producing areas to provide advice, training to user groups and monitoring activities for policy and investment. • Functioning support service centres and arrangements at local level for cost recovery, technical services and advice (operations, maintenance and repairs to machines and equipment) especially power-tillers, processing equipment; carrying out medium- to large-scale processing for value addition and product development; also used for storage of spare parts, fertilizers, agrochemicals and equipment. • User groups of small-scale producers trained and managing machines and equipment for mechanical cultivation of lowlands, and added value activities and product development in their enterprises. • Guidelines and procedures will be enforced to ensure standardization and pretesting of all small- to medium-scale machines, equipment and accessories to be supplied for the activity, essentially to ensure appropriateness to soil and environmental conditions of the country. • Securing support urgently from development partners particularly the Chinese Government and indigenous private sector interested parties. • Clear policy guidelines established on the nature, strategy and scope of the project in the short to medium term. • Identify suitable lowlands and farmer groups/communities and cooperatives to be involved in the project; confirm their needs, requirements and inputs for the implementation of the project. • Establish special unit with subunits within MOA and community support services in the regions/counties and programme for their involvement in the project. • Prepare plan of work of the project indicating construction of centres, assessment, procurement and installation of equipment and machinery, determination of the technologies to be applied; training; assistance to establish farmers' groups/cooperatives; establish linkages with support sources, etc. Train beneficiaries to operate and manage machines.
Expected result(s)	1. Increased economies of scale in land use and cost-effective use of improved technologies for production of crops, enhancing investment by farmers' groups. 2. The activity will stimulate farming communities in the areas of operation to form groups through which consolidated actions could be taken to increase their access to essential inputs such as improved seeds, fertilizers, other agrochemicals, hand tools and equipment. The group activities will attract extension services to the communities, firstly from the agencies that operate the mechanization practices and secondly from the national Ministry extension services. 3. The mechanized service activities will provide opportunities for employment of young people as drivers, mechanical engineers, agronomists and farm hands. 4. The accelerated production of rice will promote the self-sufficiency of the commodity, reducing the reliance on external supplies. 5. There will be concrete evidence that self-sufficiency in rice production could be achieved in the shortest possible time to meet national needs.

	6. Large numbers of farming communities in the area of the projects will participate in the mechanization schemes because the practice will relieve them of the labour-intensive manual preparation of land. 7. The availability of such technologies will have enhanced much greater participatory development, and encouraged smallholders to operate in groups for economies of scale, reducing high labour input, and maximizing profits.
Impact on food security, poverty reduction & economic development	1. There will be a noticeable increase in the availability of staple food commodities, particularly rice and vegetables, throughout the year, resulting from continuous cultivation of the lowlands and extending the production base; this will increase food security measurably at household level and improve access to food by the most vulnerable social groups. 2. Increased incomes of the smallholders through increased and continuously improved production, marketing and value addition. 3. Through the promotion of improved labour saving and post-harvest loss reduction techniques, and the introduction of double/triple cropping of rice, reduction in costs of production of staple food commodities will be seen; the country will dramatically increase its competitive advantage in rice production, and compete reasonably with cheap imports. 4. Much greater willingness and significant movement towards lowland cultivation of rice compared with uplands. A noticeable change in land use by the rural people (uplands for tree crops and lowlands for rice and vegetables) and dry season commercial production increasing productivity and economic development.
Period of execution	5–10 years
Estimated cost	US$4.5 million

Inputs per centre	**Budget (US$)**
1 Equipment and machinery*	2 500 000
2. Infrastructure (buildings, storage, roads, drying floors, etc.)	1 000 000
3. Support service units	75 000
4. Training	150 000
5. Materials and supplies	80 000
5. Various technical and operational services, travel	350 000
6. General operating expenses	70 000
TOTAL	**4 225 000**

***Equipment and machinery includes:**

- power-tillers and equipment/trailers
- transplanters
- medium-size mobile combine harvesters
- mobile, motorized small-scale threshers (1 000 kg/hr)
- 250–500 kg/hr rice mill & accessories
- storage facilities and packaging materials
- ancillary equipment and services