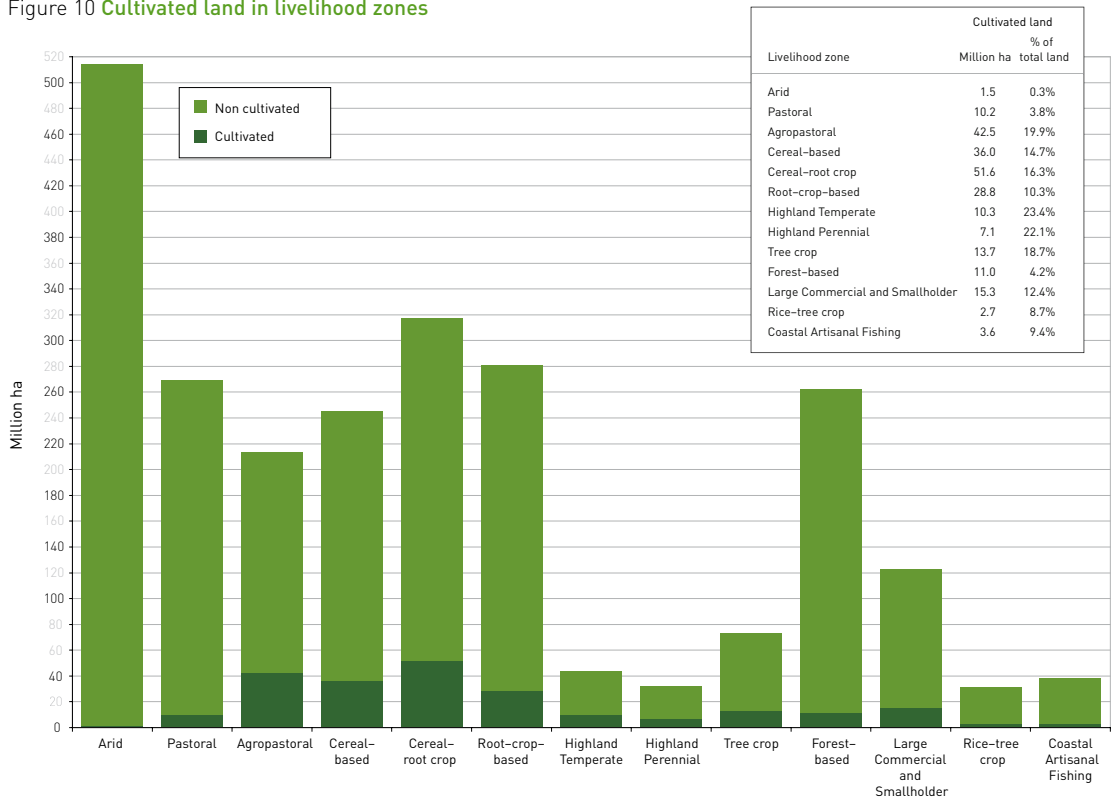


Figure 10 Cultivated land in livelihood zones



This zone, together with the cereal-root crop and agropastoral zones, produces the majority of cereals that are consumed in the region.

In terms of resources available for the rural population, the agropastoral zone has by far the highest amounts of both cultivated land and livestock available per head of population, accounting for more than 1.1 ha/person of land and more than 900 head of livestock per 1 000 people. Crops and livestock are of comparable importance in this livelihood zone (Figure 11).

Although the cereal-root crop zone shares some characteristics with the cereal-based zone (mainly the length of growing period), the former has certain characteristics that set it apart:

- a relatively low population density;
- abundant cultivated land;

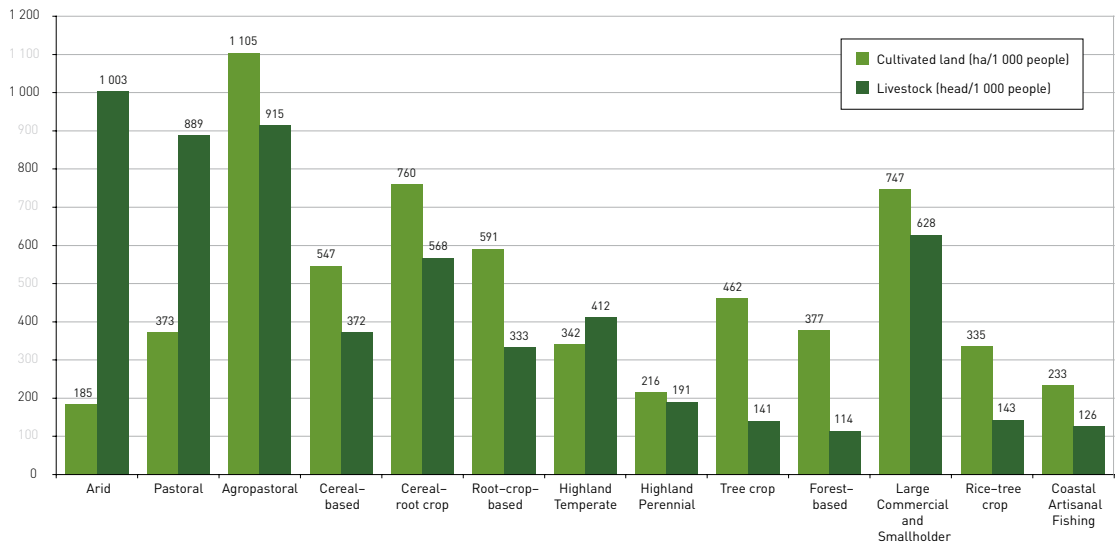
- poor communications;
- lower altitude;
- higher temperatures;
- the presence of a tsetse challenge that limits livestock numbers and prevents the use of animal traction in much of the area (FAO and World Bank, 2001).

The high density of the rural population in the cereal-based zone implies a limited availability for people of both cultivated land and livestock. Finally, livestock numbers per capita are high mainly in the arid, pastoral and agropastoral zones, reflecting their livelihood nature.

Irrigation and water resources

Although renewable water resources in SSA are abundant in overall terms, they are very unequally distributed in time and space. Despite the shortage in many areas, water control is gener-

Figure 11 Land and livestock resources available to rural people in livelihood zones



ally limited and irrigation plays a minor role in the region. Rainfed farming covers most of the region's cropland (97 percent) and produces most of the region's food. Figure 12 shows the relatively marginal importance of irrigation in SSA agriculture. Water remains an untapped resource for the majority of the region – the actual irrigation area represents only 20 percent of the irrigation potential as estimated by FAO.

Figure 13 shows the irrigation potential that is unexploited in the majority of the livelihood zones. In some zones, abundant and regular precipitations explain the limited investments in irrigation. In other zones, particularly the rice-tree crop, pastoral, arid, and large commercial and smallholder zones, where irrigated agriculture is significant in rural population livelihoods, have almost reached the limit of their potential, and

Figure 12
Irrigated land in relation to total cultivated land in livelihood zones

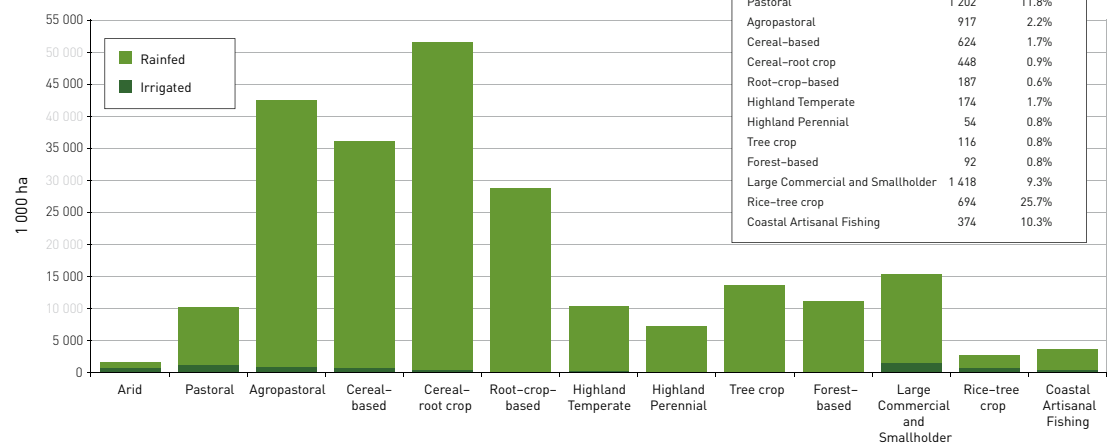


Figure 13 Irrigated land in relation to potential in livelihood zones

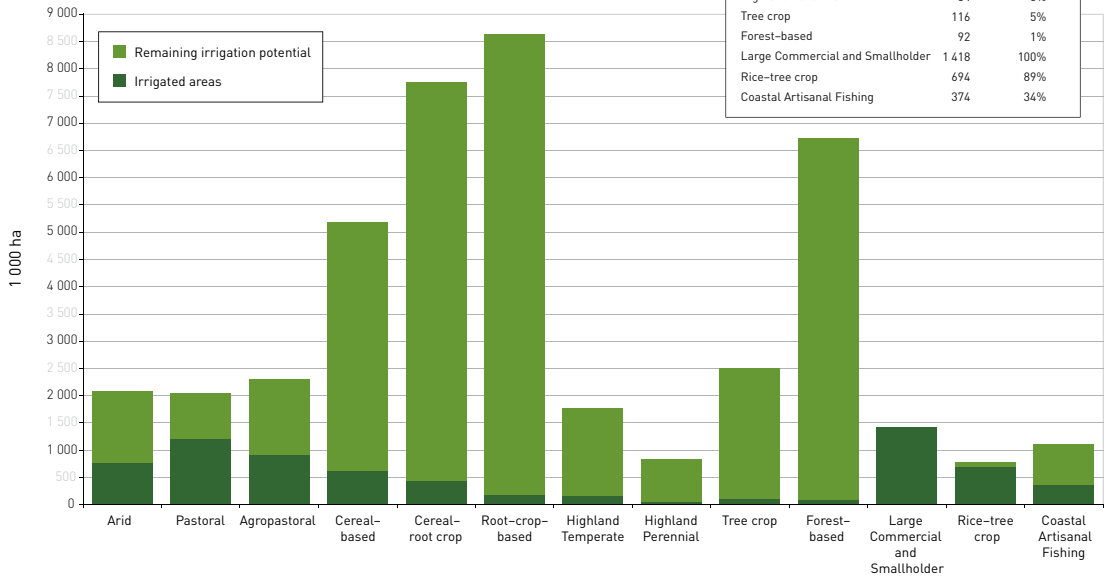
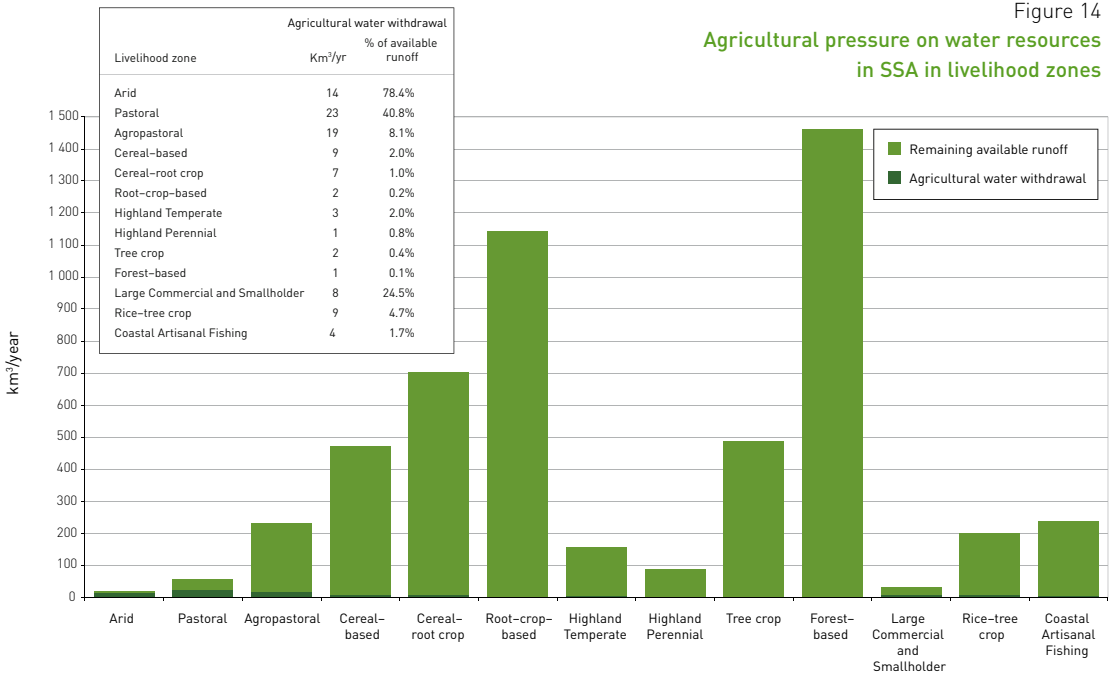


Figure 14

Agricultural pressure on water resources in SSA in livelihood zones



further development of water control may be limited. However, other zones, such as the agropastoral and pastoral ones, where there is a strong human pressure on the limited water resources, might explore other forms of water control, such as soil moisture management, water harvesting and livestock watering. Figure 14 shows that the magnitude of unexploited water resources is substantial in most zones. Table 4 summarizes the data on agriculture, land, water and poverty in the different livelihood zones of SSA.

Assessing the potential for poverty reduction through water interventions

While not always the main limiting factor, water is a crucial input for boosting agricultural production and other water-related livelihood activities. To achieve the greatest efficiency in the use of resources, water investment policies should take into consideration where water interventions can make a difference for rural livelihoods. In other terms, such interventions should be directed to livelihood zones where water is central to mitigating rural poverty.

To this purpose, identifying the areas with the highest potential for water-related interventions to reduce rural poverty becomes of great importance. Given the prevalence of agriculture in SSA livelihoods, the potential for poverty reduction through water should be assessed mainly on the basis of agricultural needs. However, it is important to recognize that water plays a key role in multiple aspects of rural livelihoods. Therefore, agricultural water interventions should be accompanied by complementary interventions that recognize such uses. Different water interventions suit different areas according to the agro-ecological and livelihood conditions. Areas with high potential and extensive poverty should be targeted for such interventions. Contrary to some conventional wisdom, targeting arid and

semi-arid agro-ecological zones, despite apparent need, is not necessarily the most effective poverty-reducing option. Greater scope for reducing poverty and hunger, in terms of population density, incidence of poverty, and agricultural potential, might exist in areas of high potential, such as subhumid and humid zones, while alternative livelihood programmes might be needed in areas with less agricultural potential.

On the basis of the livelihood zones described and mapped out in the region and on that of the analysis of poverty, water and agriculture, this study has identified areas with potential for poverty reduction through water-related interventions by assigning a qualitative score (low, moderate and high) to each zone. The potential in each livelihood zone has been assessed on the basis of the following criteria:

- prevalence of poverty;
- water as a limiting factor for rural livelihoods;
- potential for water intervention.

Prevalence of poverty

This criterion takes into account both the absolute number (density) and percentage of rural poor in each livelihood zone. Poverty figures come from the rural poverty map (above). On the basis of these two factors, the prevalence of poverty has been assessed by livelihood zone (Table 5).

Water as a limiting factor for rural livelihoods

This criterion shows where water is the principal binding constraint, mainly for agricultural production but also taking account of other livelihood activities where lack of water may be a constraint. It illustrates how water can make the difference where it is the entry point for agriculture and other livelihood activities. This assessment is based mostly on field experience combined with information gathered from the literature, and on

information on the prevalence of droughts and dry spells (and the way they affect smallholders). In densely populated areas, the need for agricultural intensification has also been considered in determining these criteria. The classification is given in Table 6.

Table 5 Prevalence of poverty by livelihood zone	
Livelihood zone	Rural poverty prevalence
Arid	low
Pastoral	high
Agropastoral	high
Cereal-based	high
Cereal-root crop	high
Root-crop-based	moderate
Highland Temperate	high
Highland Perennial	moderate
Tree crop	low
Forest-based	moderate
Large Commercial and Smallholder	low
Rice-tree crop	moderate
Coastal Artisanal Fishing	low

Table 6 Importance of water as a limiting factor by livelihood zone	
Livelihood zone	Water as limiting factor
Arid	high
Pastoral	high
Agropastoral	high
Cereal-based	high
Cereal-root crop	high
Root-crop-based	low
Highland Temperate	moderate/high
Highland Perennial	moderate
Tree crop	low
Forest-based	low
Large Commercial and Smallholder	high
Rice-tree crop	low
Coastal Artisanal Fishing	low

Potential for water intervention

The criterion represents the physical potential for water control development. It is based mainly on the availability of additional water for agriculture. It is assessed on the basis of existing information on water resources, water withdrawal, current irrigation, and potential for further irrigation development. Specifically, the score has been assigned taking into consideration two indicators: the remaining irrigation potential (ratio between actual and potential irrigation); and the anthropogenic pressure on water resources (ratio between agricultural water withdrawal and total internally renewable water resources). Table 7 presents the results of this assessment.

Priority for action

Priority for action is obtained by combining the three criteria presented above. It represents the potential for poverty reduction through water-related interventions in the different livelihood zones. For example, where poverty prevalence is high, and water is the main limiting factor for rural livelihoods, and where enough water

Table 7 Potential for water intervention by livelihood zone	
Livelihood zone	Potential for water interventions
Arid	low
Pastoral	low
Agropastoral	moderate
Cereal-based	high
Cereal-root crop	high
Root-crop-based	high
Highland Temperate	moderate/high
Highland Perennial	moderate
Tree crop	high
Forest-based	high
Large Commercial and Smallholder	low
Rice-tree crop	moderate
Coastal Artisanal Fishing	moderate

resources are available, then the potential for poverty reduction is high. At the other extreme, where poverty prevalence is low, and water is either physically scarce or not a limiting factor, there is little potential for poverty reduction through water investment.

Table 8 and Figure 15 show the assessments of the potential by each of the criteria, and the overall priority for action. Combined, the livelihoods zones showing highest priority for water-related interventions are host to 202 million rural people, about 48 percent of the rural population of SSA, and 53 percent of the rural poor. The three levels of priority are discussed in detail below.

Priority level 1: high

Figure 15 shows the location of the livelihood zones with highest priority for effective intervention. These zones extend mainly between the dry and moist semi-arid climates. They are areas where potential production is relatively high. High-potential areas are spread over zones driven by cereal production. Cereal-based, highland temperate, agropastoral and cereal-root crop zones have a high potential for poverty reduction.

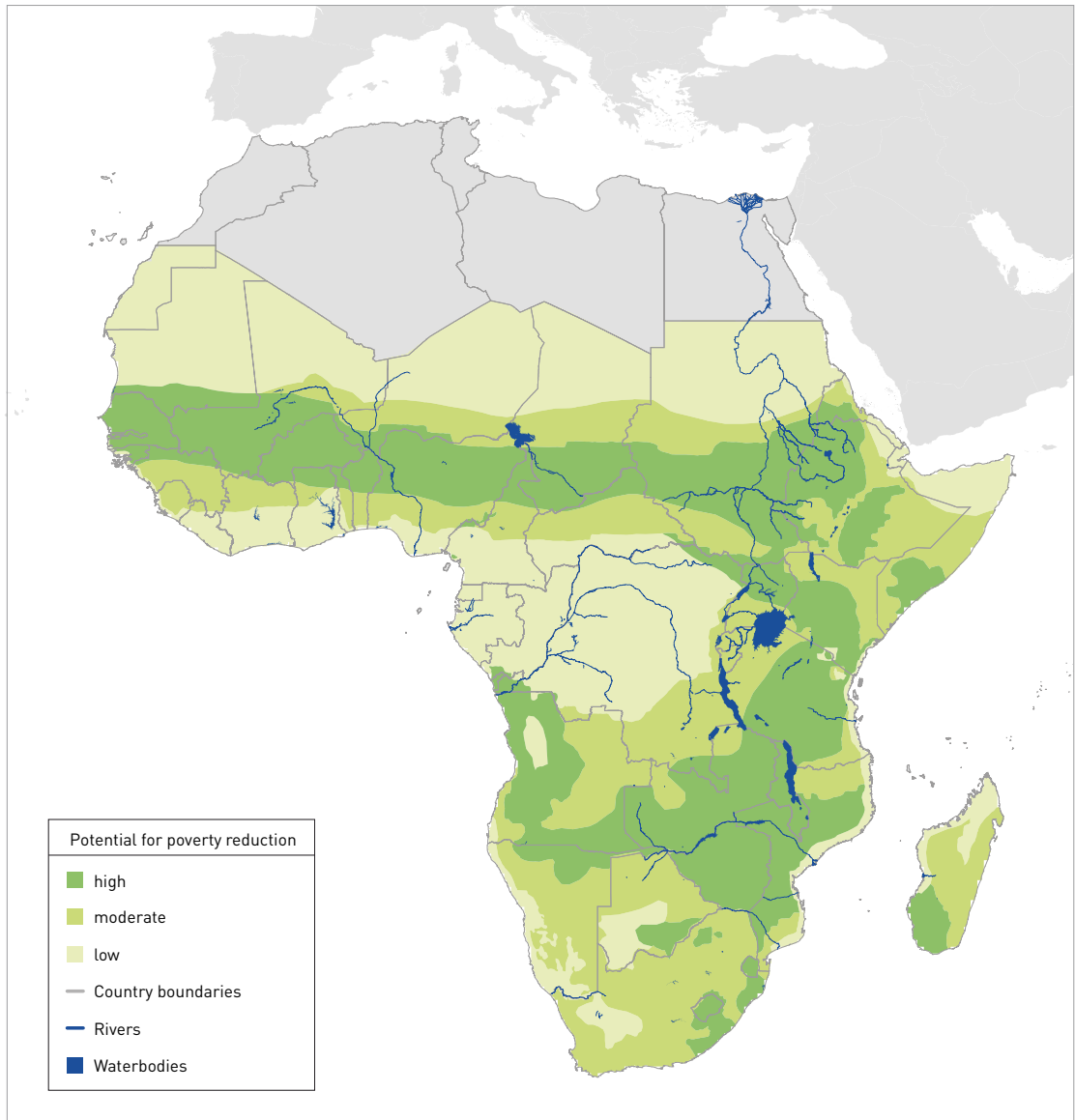
Because of their relatively important natural resource base, high-priority areas are those that offer broad opportunities for agricultural growth. Agriculture is particularly significant in these zones – most of the cereals that feed the region come from these areas. At present, water in these zones is sufficient, but it is subject to an annual and interannual variability that affects agriculture. The zones host many rural people (about 50 percent of the region's total), at a density of about 25 inhabitants/km² (higher than the regional average of 17 inhabitants/km²).

Many of the region's poor and hungry persons live in these areas, accounting for almost 55 percent of total rural poor of the region. Livelihoods, and more specifically agriculture, in these areas depend considerably on water availability and are vulnerable to interannual variability. Water is also a constraint owing to the high population density. The greatest scope for poverty reduction and livelihood improvement in these areas is represented by the untapped agricultural potential, for both farming and livestock. Intervention options should promote not only irrigation but, in the case of the agropastoral zones, exploit the great potential for

Table 8 Priority for action: poverty reduction through water interventions by livelihood zone

Livelihood zone	Rural poverty prevalence	Water as limiting factor	Potential for water interventions	Priority for poverty reduction
Arid low	high	low	low	low
Pastoral	high	high	low	moderate
Agropastoral	high	high	moderate	high
Cereal-based	high	high	high	high
Cereal-root crop	high	high	high	high
Root-crop-based	moderate	low	high	moderate
Highland Temperate	high	moderate/high	moderate/high	high
Highland Perennial	moderate	moderate	moderate	moderate
Tree crop	low	low	high	low
Forest-based	moderate	low	high	low
Large Commercial and Smallholder	low	high	low	moderate
Rice-tree crop	moderate	low	moderate	moderate
Coastal Artisanal Fishing	low	low	moderate	low

Figure 15 Potential for poverty reduction in SSA through water interventions



promoting interventions more related to soil moisture management and rainfall harvesting options as well as livestock watering. For all these reasons, such areas offer the greatest opportunities for expanding food production, and they warrant a large portion of rural investment funds, especially through water interventions but also undertaking farm improvements, such as crop diversification

and production intensification. Investments and other interventions in water control are needed in order to support farm improvements, and they can make the difference for livelihoods.

In selecting the right type of intervention, it is important to recognize that most agricultural production in SSA, now and in the future, will

occur in rainfed areas. There is substantial potential to enhance rainfed agriculture, in particular maize, and to a certain extent sorghum and millet. Managing rainfall variability over time and space will be most important. Upgrading rainfed agriculture requires that technologies be well adapted to local biophysical and sociocultural conditions, accompanied with institutional and behavioural changes. The productivity of rainfall in arid and semi-arid environments can be increased substantially with appropriate water harvesting techniques.

Priority levels 2 and 3: moderate and low

The fact that an area is classified as one of moderate or low potential does not imply that water-related interventions are not needed. Rather, it suggests that the poverty-reduction impact will be minor, either because of the lower prevalence of poverty or because other types of interventions might be more suitable. These areas may have poor soil fertility that needs to take priority in being addressed, or they may be ones where the main livelihood activities are not vulnerable to a lack of, or variability in, water supply. They may also be areas where water it is not a crucial factor for livelihoods, as is the case in the forest-based and tree crop zones. In such areas, a number of interventions are needed. Among these, water-related ones, while not the most important, may nevertheless play a key role. Examples of appropriate policies in such zones are given below.

Areas with good market potential depend on farm-level improvements through intensification and diversification, supported by irrigation and market development. In such zones, farm size must be increased where possible, and holdings consolidated as aggregate productivity is often constrained by land fragmentation.

The same problem exists in highland perennial zones, which have a favourable climate, but

also the highest density of rural population. Many farmers in these zones depend on small amounts of land. Although poverty is moderately severe, good opportunities can exist to contribute to alleviating poverty by intensive agricultural growth supported by investments in water control.

Poverty reduction in the rice–tree crop zone will be accomplished largely by diversifying crop, livestock, and fish production and by improving water management. In addition, agricultural intensification and increases in non-farm income through local processing of farm produce may contribute to poverty reduction efforts.

In arid and pastoral zones, where there is very limited potential to develop water control, poverty reduction often depends on seasonal or permanent migration to seek employment as labourers in wealthier zones or urban areas. There is a substantial need for alternative livelihood activities to agriculture or livestock husbandry. Over time, increases in off-farm income and exit from agriculture are likely to be at the core of poverty reduction efforts. In many cases, on-farm diversification and increases in off-farm employment will be more helpful than investments in water control in reducing poverty in these areas.

Livelihood diversification and increased off-farm income will also be the major mechanisms for reducing poverty in rainfed humid livelihood zones. Livestock production and small-scale farmer-managed irrigation will play major roles in diversification and intensification. Poverty reduction in rainfed highland livelihood zones and rainfed dry/cold livelihood zones will also be accomplished primarily through increases in off-farm income and exit from agriculture. Diversification to high-value products with relatively low transport and marketing costs will be helpful in these regions, given the more limited prospects for improving low-value agricultural production.