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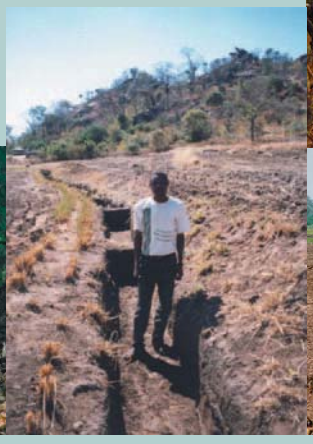
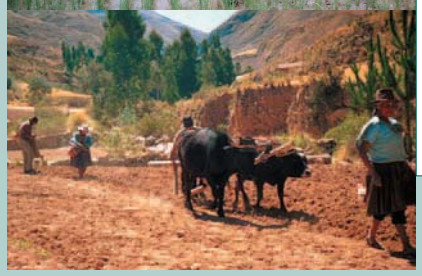
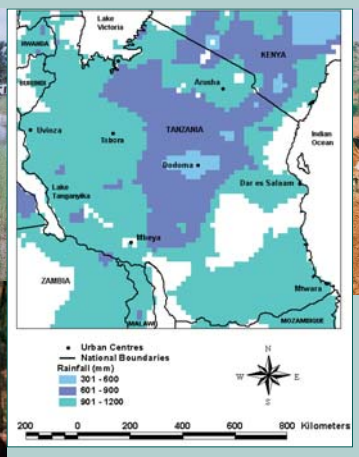


The Characterisation of Six Natural Resources Production Systems

J. Taylor, M. Tang, C. Beddows, F.M. Quin, M.A. Stocking





August 2003

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Natural Resources Systems Programme

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4 RESEARCH FINDINGS

4.1 OVERALL DATA ANALYSIS AND MAIN CONCLUSIONS

4.1.1 Data Analysis

Table 4.1 and Figure 4.1 summarise the Study's results with respect to ranking and assessing relative priorities between the six production systems. Both are derived from the values and rankings (by PS, dataset version and criterion weighting scenario) of the weighted scores that are presented in the final summary tables of each scoring method (see App-28, App-35 and App-42). The table and the figure present three prioritisation assessments (A, B and C) which are further described below. All assessments follow the same analytical procedure (as described for Assessment A below) but they examine different selections of the weighted score values, as follows:

Assessment A. This assessment considers all the weighted score data. For each scoring method, the PS means for the weighted scores (calculated across the three dataset versions and five weighting scenarios) are prioritised using two procedures: simple ranking on a scale from 6 to 1, where '6' identifies the largest mean value and is assigned the highest priority and '1' identifies the smallest mean value and is assigned the lowest priority (Table 4.1, Section A1); and proportional (percent) ranking using the sum of the mean weighted scores across PSs for each scoring method as the denominator for the calculation (Table 4.1, Section A2).

The summary tables in the appendices for each scoring method (see App-28, App-35 and App-42) rank each set of the six PS weighted score values on a scale from 6 to 1 (as described above). Figure 4.1A presents the frequency counts of these rankings across all scoring methods (n = 45 [3 scoring methods by 3 dataset versions by 5 weighting scenarios]).

Assessment B. This assessment considers only the weighted score values obtained for the Version 3 dataset (n = 15 [3 scoring methods by 1 dataset version by 5 weighting scenarios]). Except for the LWI (see Section 4.2.4), the Version 3 dataset uses PS definitions that are most closely aligned with the present geographical coverage, within the target countries, of NRSP's past and on-going projects. For this reason, it is singled out for examination on its own (see Table 4.1, Section B and Figure 4.1B).

Assessment C. This assessment singles out Scenario 4 of the weighting scenarios because this scenario gave greater weighting to the poverty status criterion (n = 9 [3 scoring methods by 3 datasets by 1 weighting scenario]). This weighting (3 out of the 10 weighting points), combined with the larger weighting given to people (3.9 out of the 10 points), arguably is the best aligned of the five scenarios considered with the donors policy priorities (see Table 4.1, Section C and Figure 4.1C).

4.1.2 Main Conclusions

Overall ranking of PSs. The simple rankings (see Table 1, Sections A1, B1, C1 and D) identify the semi-arid (SA) PS followed by the high potential (HP) PS as highest priority indicating, on the basis of the method used in this Study, that these PSs have the greatest need. Similarly, the peri-urban interface (PUI) most commonly is identified as having the lowest priority (and therefore least need). After the SA and HP PSs, the ranking of the other PSs most commonly follows the sequence forest agriculture interface (FAI), land water interface (LWI) and hillsides (HS). This same ranking is evident when frequencies of ranking on the 1-6 scale are considered (see Table 1, Section D and Figure 4.1), but with evidence of the LWI rising to higher priority than the FAI in Weighting Scenario 4 (poverty emphasis) (Fig 4.1C).

Table 4.1 Summary of overall findings, derived from the summary tables in Appendices 2 to 4 (see App-28; App-35; and App-42)

Basis of comparisons	HP	HS	SA	FA	LW	PU
A. All results (3 dataset versions by 5 weighting scenarios by each scoring method):						
A1. Simple Overall Ranking (6 = greatest need; 1 = least need)						
Simple scoring method	5	1	6	3	4	2
Relative scoring method	5	2	6	4	3	1
Relative scoring method adjusted for population double counting	5	3	6	4	2	1
A2. Proportional Overall Ranking (percent)						
Simple scoring method	19	12	23	16	16	14
Relative scoring method	19	13	27	17	14	10
Relative scoring method adjusted for population double counting	19	14	28	16	13	10
B. Version 3 dataset only (by 5 weighting scenarios by each scoring method):						
B1. Simple Overall Ranking (6 = greatest need; 1 = least need):						
Simple scoring method	5	1	6	3	4	2
Relative scoring method	5	2	6	4	3	1
Relative scoring method adjusted for population double counting	5	2	6	4	3	1
B2. Proportional Overall Ranking (percent)						
Simple scoring method	19	11	23	16	17	14
Relative scoring method	20	13	26	17	15	9
Relative scoring method adjusted for population double counting	19	13	27	17	14	10
C. Criterion Weighting Scenario 4 only (by 3 dataset versions by each scoring method):						
C1. Simple Overall Ranking (6 = greatest need; 1 = least need):						
Simple scoring method	5	1	6	2	4	3
Relative scoring method	5	2	6	3	4	1
Relative scoring method adjusted for population double counting	5	2	6	3	4	1
C2. Proportional Overall Ranking (percent):						
Simple scoring method	20	12	22	14	17	14
Relative scoring method	20	13	25	15	16	11
Relative scoring method adjusted for population double counting	20	13	26	15	15	11
D. Grand means, modes and ranges across all scoring methods, dataset versions and weighting scenarios:						
Mean of simple ranking values	5.0	2.0	6.0	3.7	3.0	1.4
Mode of simple ranking values	5	2	6	4	3	1
Lowest and highest simple rank	5 to 5	1 to 3	6 to 6	2 to 4	2 to 4	1 to 3
Mean proportional ranking (percent)	19.3	13.1	25.7	16.3	14.5	11.1
Highest proportional rank (percent)	19.9	14.0	28.1	17.0	16.7	14.2
Lowest proportional rank (percent)	18.7	11.6	22.6	15.1	13.1	9.4
Proportional ranking relative to SA	0.75	0.51	1.00	0.63	0.57	0.43

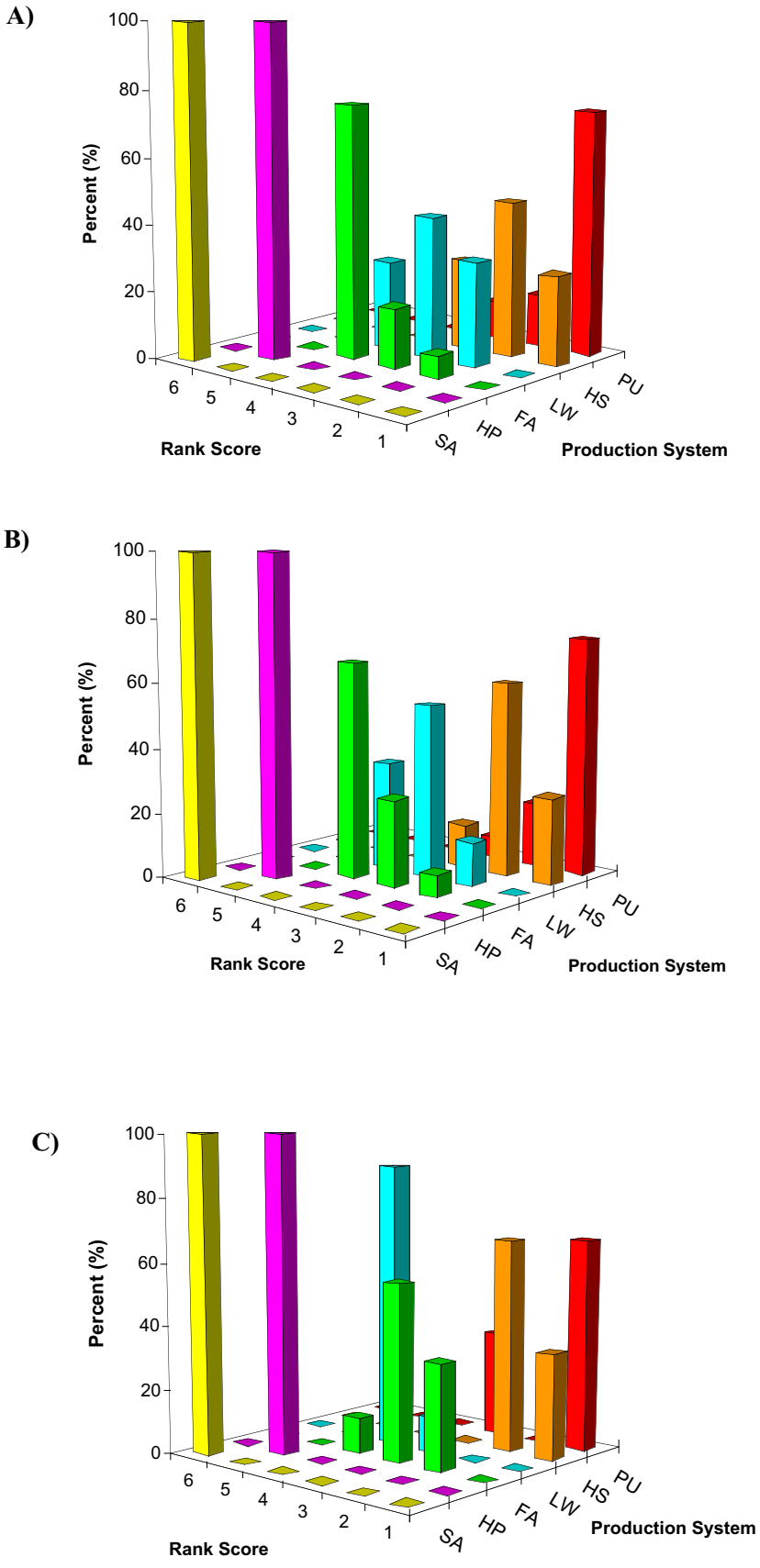

Fig 1: Frequency (%) of Rank Scores from 6 (greatest priority) to 1 (least priority) by Production System for A) All Dataset Versions; B) Dataset Version 3; and C) Criterion Weighting Secenario 4

Relative priorities between PSs. The relative proportional rankings (Table 4.1, Sections A2, B2, C2 and D) confirm the results of the simple ranking. The relative mean proportions for SA (27%) followed by the HP (19%) emphasise the importance (greatest need) of these PSs. FA follows (17%) and then LW and HS with similar relative mean proportions (LW – 14%; HS – 13%). PU has the lowest proportional ranking (10%).

Ranking for PS definitions that are well aligned with the geographical scope of NRSP. The PS definitions for the Version 3 dataset most closely match the geographical scope of NRSP in each target country. The sole exception is the definition for LW (coded LW(3)) which takes only the LWI of one target country (Bangladesh) but excludes the second target 'country', the Caribbean and the possible third target country, Uganda (also see Section 4.2.4).

As shown in Table 4.1 – Section B, the PS rankings are the same as those found in the overall analysis but in this analysis, after SA and HP as the high priority pair, FA and LW form a close mid-rank pair while HS and PU for a close low rank pair (also see Fig 4.1B where the most frequent simple ranking shows this same pairing).

Because the Version 3 dataset most closely represents the geographic scope of NRSP (as from April 1999), it is relevant to compare the prioritisation of the proportional PS rankings with the budget allocations planned for NRSP in the period of the programmes term (1999-2005)[7] (see Table 4.2 below).

Table 4.2 Comparison of the Study's predictions with NRSP's plans, as of late 2000

Comparisons:	Production System					
	HP	**HS**	**SA**	**FA**	**LW**	**PU**
Recommended from the Study:						
Mean across 3 scoring methods and 5 weighting scenarios (n=15)	19	13	26	16	15	11
Mean using the most sensitive scoring method (relative with population double counting adjusted) across 5 weighting scenarios (n=5)	19	14	28	16	13	10
Value for Scenario 4 only with most sensitive scoring method (n=1)	20	13	26	15	15	11
NRSP research funding plans:						
NRSP budget forecast for 1999-2002[8]	16	13	21	20	15	12
NRSP budget plan for 1999-2005	18	13	20	19	19	15

The comparisons in Table 4.2 show that NRSP's relative funding plans for the PSs reflect the recommendations of the Study, but could consider greater allocations to SA, less to FA, and possibly also less to LW and PU. As was stated in the introduction, a complex of factors influence funding allocations within a research programme. Similarly, the Study's findings were not intended to impose a straitjacket on NRSP's decision-making for research fund management. Nevertheless, the comparison has made evident that SA, as the highest priority PS, should be considered for a greater fund allocation.

PS ranking for Weighting Scenario 4 (greater weighting to Criterion 5 – poverty status; Table 4.1,Section C). The PS rankings for Scenario 4 are similar to those reported above, but the proportional rankings for the FAI and LWI are close with LW results indicating slightly higher

[7] / This period corresponds to the time from which NRSP effectively refocused its research to take account of the DFID-RNRRS response to the UK Government's 1997 White Paper through to the planned end date of the programme.

[8] / As of 2000, the assured budget period for NRSP was the three year period, April 1999 to March 2002.

priority than FA when poverty status is emphasised (also see Fig 4.1C). This result arises from the higher ranking of LW relative to FA for Criterion 5 (i.e., a greater need for poverty reduction in LW relative to FA) which is further amplified through the greater weighting given to poverty status in Scenario 4.

Concluding remarks. The analyses showed a high level of consistency in the order of prioritisation of the production systems between the various PS definitions (handled as three different PS characterisation datasets), methods of scoring (simple versus relative) and calculation (allocation of weightings for the characterisation criteria). All analyses identify SA and HP as having the greatest need while HS and PU have least need but with PU more commonly having the lower need in this pair. The FAI and LWI are consistently in the middle ranking. Relative to this finding, the scale of NRSP's planned funding is aligned with this priority ranking although the level for SA could be raised with corresponding reductions in the levels for the FAI and the PUI, and possibly the LWI.

4.2 OTHER FINDINGS OF THE CHARACTERISATION STUDY

4.2.1 General Comment

This Study focused on developing a sounder basis for priority setting between production systems, in the context of the donor's policy priorities. In order to do this, profiles were developed of each PS within the relevant target countries. This exercise required decisions on how to define specific PSs and brought forward some of the limitations for their characterisation e.g., difficulties in disaggregating national data to match PS boundaries. The whole characterisation exercise improved the descriptive documentation of the six PSs of DFID's RNRRS and raised NRSP's awareness of similarities and contrasts within each PS that relate to the chosen target countries. The following sections highlight these aspects of the findings of the characterisation work including the effects on the analysis of priorities between PSs.

4.2.2 Best Judgements on PS boundaries

Section 3.2 summarised the decisions that were taken to define a PS in each target country assigned to that PS. Some further details and comments on PS definition are given below.

Semi-arid PS. Out of the six PSs, the SA is the only one for which a definition could be well grounded in published agro-climatological literature (e.g., a definition based only on length of growing period, LGP). However, even for this PS it was found that it was preferable to vary the definitions between the target countries, to best reflect the geographical emphasis and coverage within each target country. Thus, for India and Zimbabwe, the definition judged to be most appropriate was lands with an LGP of 3-5 months (see Section 5, Maps 14 and 31 respectively and datasets Versions 1 and 3, page App-2) while for Tanzania a definition of lands with an annual rainfall of 300-900 mm was preferred (see Section 5, Map 24 and dataset Versions 1 and 3, page App-2).

High potential PS. For defining HP lands, the contrast of rainfed and irrigated farming was a major consideration. Thus the rainfed HP lands in Kenya were defined on the basis of the incidence of certain relatively fertile well structured soils (see Section 5, Map 21), an annual rainfall greater than 900 mm (Map 19) and LGP greater than 7 months (Map 20). In contrast, in India the HP lands were defined by using elevation to demarcate part of the major river catchment forming the irrigated lands of Indo-Gangetic Plains. The definition using lands below 150 m elevation was preferred (Maps 12 and 13 and dataset Versions 1 and 3, page App-2). In Bangladesh, it was judged that HP lands cannot be separated from the inland floodplain area that defines this target ecosystem of the LWI and therefore each PS covers the same land area (see Section 5, Maps 1 and 2 respectively). The distinction between HP and LWI in the inland floodplain of Bangladesh rests on the research aims of their respective projects with HP emphasising the land component, especially the management of farm lands.

Hillsides PS. Elevation was used to define the HS PS in all three target countries but the altitudinal limits were distinct for each target country (see Section 5, Map 4 – Bolivia, elevation 1000-3500 m; Map 22 – Nepal, 300-2500 m; Map 26 – Uganda, elevation 1500-2000 m).

Forest agriculture interface. Definition of the FAI was specific to each target country. For Ghana, LGP was used. The definition that covered lands with an LGP of 9-10 months was preferred (see Section 5, Map 9 and dataset Versions 2 and 3, page, App-2). This covers, in large part, the lands of the natural forest-savannah transition belt and more southerly lands that can support a forest climax vegetation but are also disturbed by human settlement and forest clearance. For Brazil, the lowland corridor (elevation below 100 m) of the Amazon river and its delta was taken to define the area of forest climax vegetation that is undergoing clearance and conversion to agricultural use (Maps 5 and 6). In Nepal, in a similar way to HP and LWI in Bangladesh, the FAI was judged to address certain forest and farm management situations within the land area defined for the HS PS. Thus the FAI and HS have the same definition in Nepal (Map 22).

These overlays of defined lands areas for more than one PS was the reason for applying the third scoring method where double counting of population of these areas was adjusted by the arbitrary allocation of half of the population of the defined land areas to the each of the PSs concerned.

Land water interface. As explained in Section 2.2.6, the LWI covers two ecosystems, coastal zones and floodplains, and, although the aquatic environment has priority for the coastal zone, a wider approach is taken to production constraints to consider the effects of land use practices and topography on coastal ecosystems. At the time of the characterisation study, the LWI had one target region, the Caribbean (see Section 5, Map 7) and one target country, Bangladesh (Map 2), respectively, for each target ecosystem, with Uganda (Map 29) under consideration as a second country for the floodplain ecosystem. For defining the LWI in the Caribbean, decisions had to be taken on which islands and which parts of the Americas' mainland to include. The decision on what to include was based on the regional scope of DFID's support programme and, in conformity with NRSP's conceptual approach to the LWI, the total area of islands and 20% of the mainland state of Guyana were included. In Bangladesh, based on FAO's agroecological study (FAO, 1998), a coastal zone was defined in addition to the inland floodplain, and this was included in the LWI coastal zone definition (see Map 2).

Peri-urban interface. From the outset it was recognised that the PUI would be problematical (and disadvantaged) in this Study mainly because there were no strong arguments for the number of cities/towns that should be included in the definition. At the time of the Study, and for historical reasons (see Section 2.2.7), the PUI portfolio contained only two target city regions, Kumasi (Ghana) and Hubli-Dharwad (India). It was recognised that more cities/towns should be added and decisions were taken on this, adding all major cities and towns in Ghana and a selection of cities in India (for details see Sections 5.7 and 5.10 and Maps 11 and 17). While this was judged as a reasonable decision, in that it anticipated an achievable level of scaling-up of the PUI research, the limits were set subjectively. From the outset it was agreed that to define a land area for the PUI arguably was a misconception and anyway was not feasible for this Study. Linked with this, the PS land area criterion was de-emphasised in the weights applied for comparing between PSs (also see Section 3.4). The possible size of the peri-urban population was assessed by examining the difference in metropolitan and city area population statistics (details are given in Sections 5.7 and 5.10).

4.2.3 Effects of Target Countries on PS Prioritisation

An important aspect of the method used to compare PSs is that it depended on relative rankings rather than differences in absolute values for each defined criterion. Nevertheless, large differences in some of the target country data that contributed to the characterisation criteria for a specific PS (see Section 3.1) were an important aspect of the priority ranking that was determined between the six PSs.

This was especially relevant to the rural/peri-urban population criterion. Both the HP and SA PSs include countries with large rural populations (India for SA, and India and Bangladesh for HP). This gave these PSs high relative ranks for the population criterion. When combined with the high weighting given to people (39% in all weighting scenarios), this carried these PSs through to their highest relative rank for this characterisation criterion, and their high PS ranking overall (as reported in Section 4.1).

Of course, the effects of large populations could have been altered by changing the weighting points given to the population criterion. However, the weightings were assigned to reflect the donor's policy priorities and, in this respect, the outcome reflects developmental need expressed through numbers of people.

As shown in Section 4.1, the FAI held third priority ranking after SA and HP. Unlike HP and SA, this PS does not have a distinctly large population and in the analysis of datasets Versions 1-3 it variously had the lowest or second lowest weighted score for Criterion No. 2 – rural population. However, for some of the other characterisation criteria, FA had higher rankings and hence in the overall analysis it was ranked third priority following SA and HP and above LW, HS and PUI. Thus, the method followed enabled differentiation between the four PSs with smaller and more comparable populations.

As reported above (Section 4.1.2), there was one instance (Scenario 4 – greater weighting to poverty) where LWI was ahead of FA in the middle rankings (this is well illustrated in Fig 4.1C). Both PSs include target countries with acute poverty problems (Nepal for FA and Bangladesh for LW) and less acute problems (Brazil for FA and the Caribbean for LW). However, because weighted means were generated for the three descriptors of the poverty status criterion (Criterion 5), the higher population of Bangladesh (in LW) relative to that of Nepal (in FA) gave rise to lower values for the descriptors and in turn higher rankings for the poverty reduction need for LW. When linked with the weighting for poverty in Scenario 4, this placed the relative priority of LW slightly above that of the FA.

In sum, therefore, whilst the method for PS comparison purposely used relative rankings based on simple or relative scores, the target countries specified for a PS, particularly the size of their national populations, were a key factor in the prioritisation that was determined between the six PSs. Put another way, human population was an all pervasive aspect of the PS Characterisation Study.

4.2.4 Comparison across PSs – Poverty Status

Use of national statistics for poverty status. Although data from national statistics were available for the three variables that were used to define Criteria No. 5 – poverty status (i.e., average GDP, literacy rate, Harvard Scale data for child nutritional status) it was not possible to fine tune these data to the circumstances of the people within the land area of a PS in each of its target countries. Therefore the national statistics had to be used as the best estimate available for PS poverty status. Weighted means, based on the estimated population of a PS in each target country, were calculated to provide a measure of the scale of the poverty problem of a PS in a defined target country.

As was described above (see Section 4.2.3), this weighted assessment of the poverty status criterion, when combined with the higher weighting that it was given in Scenario 4, raised LW to a slightly higher priority than FA in that scenario. The relatively large population of Bangladesh and low values of the statistics for Criterion 5 explain this shift. (Out of the eleven target countries of this Study, only Nepal had (slightly) lower values than Bangladesh for Criterion 5).

The three PS definitions for the LWI (LW(1)-LW(3)). The large contrasts between the target countries of the LWI in respect of population and poverty status (particularly Bangladesh compared with the Caribbean) were the reason for the three PS definitions that were considered for the LWI. Linked with this, these definitions also addressed some concerns of the donor about the continued inclusion of the Caribbean in NRSP's research portfolio and the possible commencement of NRSP-LW research in the third target country for LW, Uganda (also see Section 2.2.6 and Table 2.1).

LW(1) examined only floodplains (Bangladesh and Uganda) based on the argument that the LW portfolio could take on this emphasis if NRSP's research in the Caribbean was wound down. LW(2) examined the target countries of LW as they were in mid-2000 (Bangladesh and Caribbean) and then LW(3) examined only Bangladesh (floodplains and coastal) (also see App-2). Even though the Version 3 dataset was intended to match most closely the existing and planned geographic scope of NRSP, purposely, in respect of the LWI, LW(3) was included rather than LW(2) in this dataset. The reasoning was that as the donor had queried the geographic scope of this PS, for forward planning purposes, its importance relative to the other PSs, should be assessed with the problematic target region (Caribbean) removed.

As shown in Table 4.1 and Fig 4.1, LW(3) in the Version 3 dataset confirmed the middle ranking of the LWI, following the FAI and the need of Bangladesh for relevant LWI research[9].

4.2.5 Comparison across PSs – Other Criteria

Although Weighting Scenario 4 has been singled out for closer examination in this report (see Section 4.2.4 above and Table 4.1, Section C and Fig 4.1C), the other scenarios could be used if particular arguments on priority setting needed to be addressed e.g., Scenario 2 assesses priorities when the importance of, and problem of need for, good market infrastructure is emphasised while Scenario 3 assesses priorities when the productivity potential of the natural resource based is emphasised.

4.3 COMMENTS ON THE STUDY'S METHOD

The Study's method has proved to be robust in the sense that attention to varying PS definitions and alternative ways of comparing between PSs to assess relative importance has, in the end, not shown significant differences in the conclusions reached. The attention paid to considering different definitions of a PS within a specific target country, the various versions of combining PSs across target countries, and the alternative ways of comparing across PS data using different scoring methods and weighting scenarios did not produce any major changes in findings for PS characteristics and differences and relative priorities between PSs. It is therefore considered that the results have an independent rationality when considered in relation to the countries that are included in each PS.

As has been discussed above (see Section 4.2.3), the target countries (that are specified by DFID) of each PS have a large effect on the needs rankings. Within this, the size of their target populations mainly explains the high priority of the SA and HP with the size of India and its population as a major factor in this. However, importantly, the ranking procedures of the method enabled differentiation of PSs with more comparable populations.

An additional aspect of the method is that it demonstrates a procedure for evaluating the implications of a donor's developmental policy priorities for making strategic decisions on certain aspects of setting research priorities. Key steps were to define characterisation criteria that directly or through proxies reflect a donor's policy and to work with rankings and weightings in order to apply a standard assessment procedure to all the criteria considered.

[9] / With respect to NRSP's research planning, because of the generic relevance of the Caribbean-LW research and the benefits that were arising from research continuity in that region, it was argued and accepted that it was preferable to continue LW research in that region rather than start a new initiative specifically in the Bangladesh coastal zone. This is an example of how a priority setting exercise has to be adjudicated with other considerations regarding research efficiency and best value.