

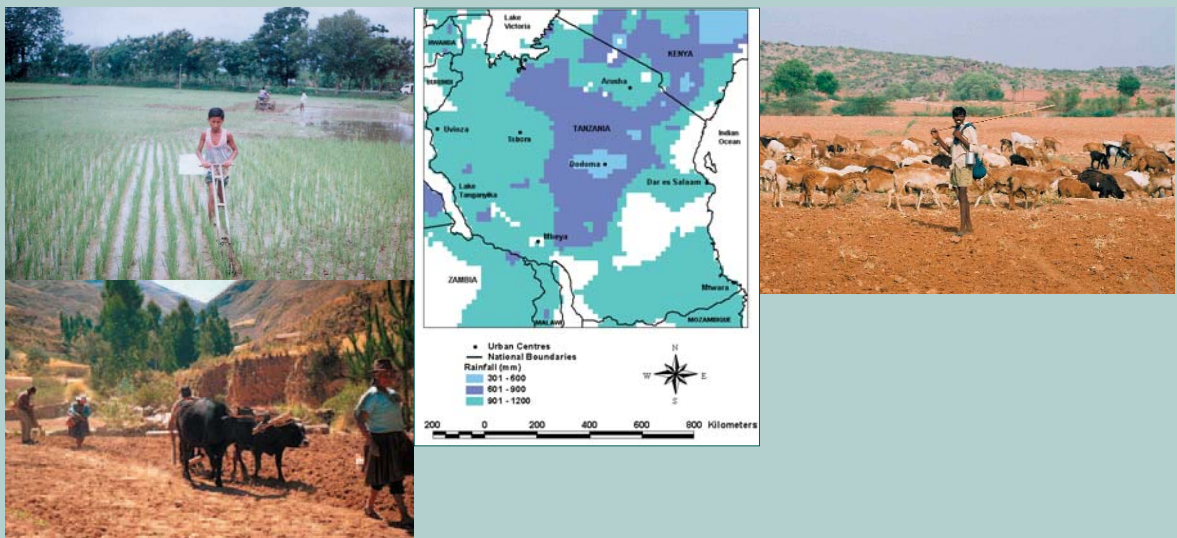


DFID Natural Resources Systems Programme



The Characterisation of Six Natural Resources Production Systems

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



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3 SYSTEMS CHARACTERISATION – METHODS AND SOURCES

3.1 CRITERIA FOR SYSTEMS CHARACTERISATION

The production systems in each target country were characterised in terms of the following six main criteria:

- a) Land area (km²).
- b) Human population – total, rural, and urban (and sub-sets of urban in the case of the PUI).
- c) Market demand and marketing capacity as a measure of the opportunities for rural people to generate income. Proxies used to assess market infrastructure and the strength of market demand were:
 - c-i) Road density (km of roads per square kilometre converted to an assessment using a five point scale where 5 = dense and 1 = sparse) [This served as a proxy for the potential of the supply side to realise the opportunity offered by an existing market demand].
 - c-ii) The number of towns with greater than a specified threshold population (or town built up areas of greater than a specified threshold area) per unit area of the PS. [This was a proxy for the relative strength of market demand].
 - c-iii) Assessment of the export potential from the PS to major areas of demand outside the PS. The distance (km) from mid-points of a PS to the major cities of each target and neighbouring countries were assessed. [This also was a proxy for the relative strength of market demand].
- d) Supply side assessment – land productivity potential for NR-based/related agricultural enterprises. [This was used as a proxy for the capacity of rural people to use the NR base to generate income and employment and as proxy for the potential to meet national food security targets. The ‘land’ assessment considered crop and forestry production potential and livestock carrying capacity and fish stocks. The present situation on the ground (i.e., present production of crops, livestock, fish and timber and NT products) was taken into account in the assessment of potential. The assessment also included tourism].
- e) Poverty status:
 - e-i) Average GDP
 - e-ii) Literacy rate, %
 - e-iii) Harvard scale (% children with weight for height to age)
- f) NR management knowledge base – relative national strength of this for achieving change. [The proxies were: number of degree level of national researchers and proportions qualified at BSc, MSc and PhD levels respectively); number of NR research scientists per total population of the PS and number per 1 million human population of the PS; the share of GDP allocated to NR research].

At the time of formulation of these criteria, it had not been ascertained in detail how feasible it was to obtain the needed data, within the parameters of PS definitions, in the time available and in terms of the extent of accessible information sources. In the event some of the sub-criteria could not be accommodated as planned. In some instances, some carefully judged subjective interpretation of available data was necessary. An example of this arises from the fact that national statistics are usually collected and compiled on the basis of administrative units such as districts, regions and states. The boundaries of these units may or may not match the boundary of a PS. Hence, where required, decisions had to be taken on what proportions of these data, e.g., for human population, should be assigned to a PS.

The notes that support the data entry in the target country profiles (refer Appendix 1) and the summary notes in Section 5 indicate how problem areas with the data for the criteria were handled. In some instances there was no readily available means to dis-aggregate data to a sub-national level and

so the national level statistics were applied to the PS. This occurred in respect of criterion (e) for poverty status and criterion (f) for the NR knowledge base⁶.

In the process of compiling the data for the criteria (a) to (f), it was found that a slightly modified framework was more appropriate for this exercise. Hence the data analyses reported in the Appendices use the following *standard summary framework*:

Ref	Characterisation Criteria (for each PS):	Sub-ref	Description of Variables
1	Land area	-	Measured in km ²
2	(Human) Rural Population (except PUI that used urban data)	-	Number of persons
3	Market feasibility:	3a	Road Density (relative scale from 1 [low] to 5 [high])
		3b	Market Demand Assessment (number of large towns [>100,000 population] /1000 km ² of PS)
4	Potential:	4a	Assessment of Export Potential (mid point of PS to major city [km] in the PS or an adjacent area)
		4b	Land Productivity Potential (various data used to assess percent contribution to national production converted to a scale of 1 [0-20%] to 5 [80-100%])
5	Poverty status (National data):	5a	Average GDP (USD per annum per capita,1997)
		5b	Literacy Rate % (1997)
		5c	Harvard Scale Data (% children weight/height)
6	NR Knowledge Base (National data):	6a	% of GDP to Agric Research (1991)
		6b	NR. Res Scientists (1991) per population of PS
		6c	NR Res Scientists (1991) per 1m population of PS

3.2 MAPPING THE PRODUCTION SYSTEM(S) BY TARGET COUNTRY

As is evident from the descriptions of each production system in Section 2, no specific parameters were defined for each system. However, a key criterion for the characterisation exercise was to determine the number of people living in a particular PS and, in order to do this, the boundaries of each PS had to be defined.

Before deciding on the parameters that NRSP would apply, a literature survey showed that different organisations were using different definitions to set the boundaries of a PS. Also it became evident that it was not feasible to apply a single definition for a particular PS across all the target countries concerned. Some examples of variations in definitions and the non-feasibility of applying one definition for a particular PS are given below. Further details on parameters are provided in the target country PS profiles in Section 5. The key point is that the boundaries set for a specific PS were decided on a country by country basis taking account of both the definitions applied by others (principally DFID and relevant national and international organisations) and the past and current locations of NRSP's research for a particular PS in a specific target country. Linked with this, detailed notes were kept as a record of the decision-making processes that determined the choice of PS boundaries and definitions and were the means for filling in items of missing data. Where a decision

⁶ / Given time, it would be possible to obtain estimates of criterion (f) for a PS through detailed follow up with appropriate organisations at a national level. However, such detailed follow up was beyond the scope of the Study.

had to be based on largely subjective criteria, this is noted in the country profile concerned (refer Section 5).

Examples of issues in deciding PS boundaries are:

- a) ***Contrasting situations for the high potential PS.*** The HP PS concerns rainfed and irrigated farming. For HP-rainfed (in Kenya), a combination of certain soil types and high annual rainfall defined the HP PS boundaries. For HP-irrigated (in India and Bangladesh), elevation and the limits of major river catchments were the main considerations combined with the exclusion of known areas of problem soils and non-agricultural land use.
- b) ***Delineating a semi-arid zone.*** The donor (DFID) used a relatively wide definition, encompassing lands where the mean monthly temperature is above 18⁰C and annual rainfall in the range 400-1200 mm (ODA, 1994). Other organisations used definitions based on water balance models where, under rainfed conditions in the warm and cool tropics, a length of growing period (LGP) of 75 (or 90)-120 days or an LGP of 75 (or 90)-180 days were defined as semi-arid (e.g., FAO, 1983; CGIAR, 2000). NRSP variously considered annual rainfall and LGP for defining SA lands.
- c) ***Defining the hillsides PS.*** While elevation was used to identify this PS, the altitudinal limits and relief for defining farmed and grazed hillsides varied by target country.
- d) ***Defining the FAI.*** The definitions used were diverse. LGP was applied for Ghana; a major catchment and elevation were used in Brazil; the FAI was subsumed in the HS definition in Nepal.
- e) ***The diversity of the LWI.*** Definitions used for setting the boundaries of the coastal and inland LWI were highly specific for each target country/region (i.e., Bangladesh, the Caribbean, and Uganda). The country profiles in Section 5 explain the various definitions that were applied.
- f) ***Decisions for the PUI.*** Definition of the PUI is highly problematic in that its limits are dependent on how many city regions are included. As NRSP in June 2000 covered the PUI in only two target city regions, one each in Ghana and India respectively, it was decided that the PUI would be defined by taking all larger cities (with a lower limit of 100,000 persons population) in Ghana and a sample of eight cities (from small to mega-size) in India. The rationale for this decision was that it defined a larger candidate area (i.e., number of cities) for the uptake and use of the findings of NRSP's PUI research in each target country.

For some target countries, it was judged worthwhile to characterise a PS using more than one definition of its parameters e.g., for SA in Tanzania (see Section 5.13, Maps 24 and 25) and HP in India (see section 5.8, Map 12).

The physiographic characterisation work for criterion (1) was carried out at HTS Development Ltd with technical support provided by the Spatial Information Systems section. The database and document searches that compiled the data and supporting information for criteria (2) to (6) were carried out at the University of East Anglia.

3.3 COMPILING AND COMBINING DATA BY PRODUCTION SYSTEM ACROSS TARGET COUNTRIES

Data for the criteria of the Production Systems Characterisation Study are contained in Appendix 1.

The workbook of the PS data for each characterisation criterion and the data from which these were derived (with supporting notes), are provided for each target country, in alphabetical order (pages App-5 to App-16). Because of particularly complicated situations for dis-aggregating data for Nepal, India and Bangladesh, data supplements illustrating how population and commodity data were derived are also provided (pages App-17 to App-21). The Master Summary Sheet of the combined data for each criterion by production system, with two working definitions of HP, two of SA, two of the FAI, and three of LWI is provided on page App-4.

The data were combined for each individual PS across the target countries concerned to generate totals, or means, or weighted means, as appropriate for the data of each specific criterion. Further details for each criterion are shown in the left hand data description column of the PS Master Summary Sheet (see Appendix 1, page App-4).

In cases where more than one definition of a PS within a target country was examined, combined data for the PS across the target countries were produced for more than one of the possible ways of generating the combined data for a PS. The PSs requiring this treatment were: HP (because two working definitions of HP in India were examined); SA (because two working definitions of SA in India and Tanzania respectively were examined); the FAI (because two working definitions of the FAI in Ghana were examined), and the LWI (because three working definitions for the PS as a whole were examined). Further details of the procedure that was followed are provided in the notes for Appendix 1 (see page App-2).

3.4 COMPARISONS OF DATA FOR CHARACTERISATION CRITERIA BETWEEN PRODUCTION SYSTEMS

Because multiple definitions were considered for four of the PSs, three data sets (versions) for comparisons of the PS data for the characterisation criteria were compiled from the PS Master Summary Sheet (see pages App-22 to App-24). Two scoring methods were used to compare the characterisation data across the six PSs, named as the simple and relative scoring methods.

Simple scoring (Appendix 2). For each version of the PS comparisons, the data for each individual characterisation criterion were ranked across PSs using a simple scoring scale of 1 to 6, as a comparative measure of least to greatest need (also see the notes for Appendix 2, page App-3). In the tables on pages App-22 to App-24, the rank score is shown in each PS by Criterion cell as a bold figure in the left hand side of the cell.

The tables in Appendix 2, pages App-25 to App-27, advance the analysis of the simple rank scores by applying weights to the six characterisation criteria. The weights were assigned by apportioning a total of 10 points across the criteria. Five criteria weighting scenarios are considered. In all scenarios, the weight given to the PS land area purposely was kept to the small value of 0.1. This was because, although the land area of a PS had to be defined in order to determine the number of people contained in that PS, land area *per se* was not considered to be an important criterion in the context of the donor's policy priority. This consideration was especially relevant to the peri-urban interface for which a concept that the PS concerns a defined area of land is least applicable.

In contrast, the weighting assigned to human population was high in all scenarios (a value of 3.9) reflecting the donor's emphasis on achieving an impact on people. Weights assigned to the other four criteria in the five scenarios variously changed the emphasis from, for example, greatest attention to poverty (with a value of 3 relative to 1 for the other three) to equal emphasis on all four (a value of 1.5 for each). The final steps of the analysis were to multiply each simple rank score value by the relevant criterion weight and then sum the weighted rank scores for the six characterisation criteria for each PS. The total weighted scores of each scenario by each PS [see Appendices notes, page App-3] are shown in the lower part of the tables on pages App-25 to App-27.

In the final table of Appendix 1 (page App-28), the total weighted scores of the three PS versions by the five scenarios (from App-25 to App-27) are displayed and an overall assessment of the findings is presented by (a) generating grand means for all weighting scenarios and all PS versions and (b) generating the means across all PS versions for Scenario 4 (the scenario with greater weights for people and poverty). The implications of the values in (a) and (b) for relative priorities between PSs and possible proportional fund allocation are also presented.

Relative scoring (Appendix 3). Appendix 3 uses the same three data sets as Appendix 2, but ranks the criterion data by a relative score where the value for the PS with the greatest need is assigned a value of 1. All other values are expressed as a fraction (less than 1) of that value (see Appendix 3, App-29 to App-31). This relative method better accommodates comparisons between PSs of criterion data

where values may be both relatively close or relatively distant (whereas the numerical differentiation of simple scoring implied a more equal distance between the data values).

The relative scores were then analysed and compared in the same way as the simple scoring method (see App-32 to App-34 and App-35 respectively).

Correction for double counting of some populations. In both the simple and relative scoring, the population in some target countries was double counted because the country covered two PSs with overlapping areas. This situation applied to Bangladesh (for HP and LW) and Nepal (for HS and FA). Therefore the three datasets were revised to correct for this double counting (see Appendix 4, App-36 to App-38). Using the relative scoring method, the data sets were then re-analysed and compared (see Appendix 4, App-36 to App-38; App-39 to App-41 and App-42 respectively).

3.5 RESOURCE MATERIALS

Information sources used for characterising the production system(s) were:

- World Map in ArcView
- USGS Digital Chart of the World (on the internet)
- FAO databases available in reports and digitally
- Aeronautical charts held in HTS Development Ltd archives
- World Bank documents
- CGIAR documents
- Personal communications with personnel at relevant research institutions

Further details are provided in Section 6 and in the supporting information provided in the country profile work sheets (Appendix 1, pages App-4 to App-21).