and/or enhance earthworm populations. However, adoption of new agricultural practices by indigenous farmers is not a simple task. The way they manage their crops is the result of hundreds (if not thousands) of years of empirical knowledge transmitted by word of mouth from one generation to the next (Kloppenburg, 1991; Toledo, 1995). As this knowledge is a mixture of beliefs, superstitions and practical experience, ethnological research should be carried out to guarantee that a new practice will be accepted. Examination of a few different practices across three continents and 28 tropical countries showed that annual low-input systems have detrimental effects on worms (Lavelle *et al.*, 1994). The Maala system in Congo (M'Boukou, 1997) and Totonac managment in Mexico (Ortiz-Espejel, 1997) are interesting agroecosystems in which earthworm communities are maintained systematically.

This chapter is an ethnoecological exploration of the world of perceptions, beliefs, attitudes and uses of earthworms by peasants in different countries of America, Africa and Asia. From a social point of view, it can be considered as an ethnobiological approach to sustainable soil management. We agree with other authors that only with economic and socio-cultural knowledge can the efficiency of the use of soil resources be improved (Swift *et al.*, 1994).

The ethnological approach

Human groups, through centuries of biological and cultural evolution (Klee, 1980), have built up different images of nature. The intensity of this interaction is a direct response to a given economic production system (Toledo, 1995). Once this aspect was recognized, several scientific disciplines related to rural development began to study the cultural foundations of traditional agroecosystems (Myer, 1998). As a result, several common patterns were found in most of these systems, which actually include polycultivation, ecogeographical diversity and use of small land parcels (Altieri, 1995; Bocco and Toledo, 1997).

As Altieri (1992) has pointed out, a better understanding of nature will be obtained only by mixing naive and scientific knowledge. For example, some of the ecological generalizations currently used in modern sustainable agriculture (e.g. polycultures) have been derived from traditional agroecosystem knowledge (Wolf, 1986). Thus, before new alternatives to rural development are proposed to farmers, scientists should try to understand how these groups manage their lands. We know that, in general, there are two complementary strategies of indigenous agricultural practices: those which burn vegetation (slash-and-burn practices of American farmers) and those that use organic wastes as mulching (e.g. the Maala systems of Congo). What we do not know is the perception that these farmers have of soil fertility in relation to earthworms.

Methods

Two approaches were used in this study: (i) a general inquiry involving 202 families to assess farmers' knowledge, and (ii) interactive workshops with farmers to compare and discuss beliefs and traditional knowledge.

In the first case, a questionnaire was designed for that purpose (Appendix 8.1) and applied to farmers from Mexico (north, central and south of Veracruz State), Peru (Yurimaguas), India (Yarpadi) and Congo (Niari Valley). The main objective was to evaluate the cultural acceptance by farmers of earthworm management by exploring their socioeconomic environment, together with their knowledge, attitude and conceptions about earthworms and soil fertility. All the socioeconomic, agronomic and ethnobiological data were stored in a database file directly linked to other EWDBASE files. Questionnaires were applied between August 1993 and July 1996. Table 8.1 shows the number of localities and farmers interviewed for each country.

In the second case, four farmers' meetings were carried out in Mexico during the period 1992–1995. The objective of the first three meetings was to explain to local promoters our conceptions about soil fertility and how to apply the questionnaire to interviewees. By using local promoters, we were confident that answers to the questionnaire were not biased. The last and most important meeting was held in March 1995, where three indigenous groups from different regions of eastern Mexico discussed their conceptions of soil fertility and earthworm roles.

Results

General patterns

The 202 questionnaries applied produced more than 10,000 specific data points stored in EWSOCEC (Dbase IV). In general, socioeconomic data showed that almost all interviewed peasants were low-input farmers for whom optimization of photosynthesis, natural precipitations and animal and human labour forces were the main energy inputs to crops.

Table 8.1. Socioeconomic and ethnological activities carried out in different tropical countries.

	Mexico	Peru	India	Congo	Martinique
No. of localities	16	2	1	1	1
No. of farmers	163	7	20	12	3
Farmers' meetings	4	0	0	0	0

The earthworm knowledge of indigenous farmers varied from country to country (Fig. 8.1) and even from region to region. In Peru and India, more than half of the farmers interviewed considered earthworms as organisms beneficial to the soil. In Congo, female farmers revealed a complete lack of knowledge of earthworms and showed an attitude of displeasure towards these organisms. In these three countries, there were no farmers that considered earthworms as harmful soil organisms. In Mexico, on the other hand, a lack of earthworm knowledge dominated (54%). Although 34% of farmers considered them as beneficial, in contrast with the others countries, more than 10% of Mexican farmers considered earthworms to have a harmful role.

Such a varied response by Mexican farmers was due to regional and gender variation (Fig. 8.2), a situation expected to be in other countries once more farmers are interviewed. However, it was surprising that in the Congo so many farmers were totally unaware of earthworms, when in reality these farmers have developed a special kind of crop fertilization that increases the biomass of earthworms.

Regional variation in southeastern Mexico

Three different ethnic groups inhabit the state of Veracruz in Mexico: Totonacos in the north, Nahuas in the centre and Zoques-Popolucas in the south. Their attitudes towards earthworms were varied (Fig. 8.3). Whereas the northern and southern groups (92 and 26 farmers, respectively) were very similar in their attitudes (34% of them recognized a beneficial effect and 55%

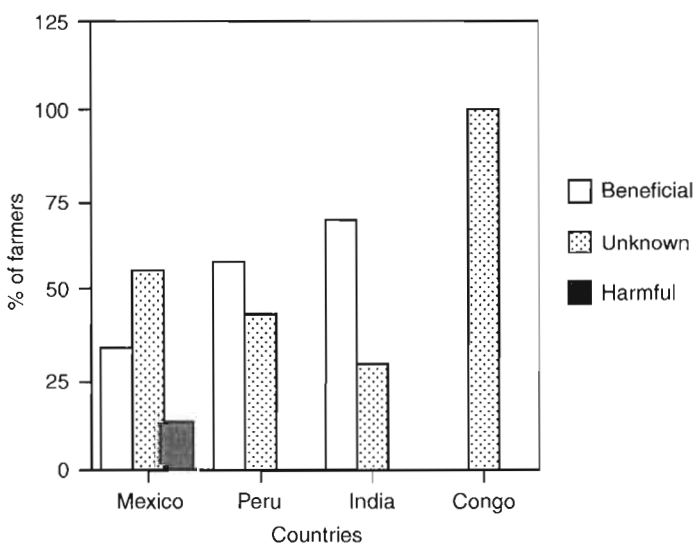

Fig. 8.1. Farmers attitudes towards earthworms in different tropical countries.

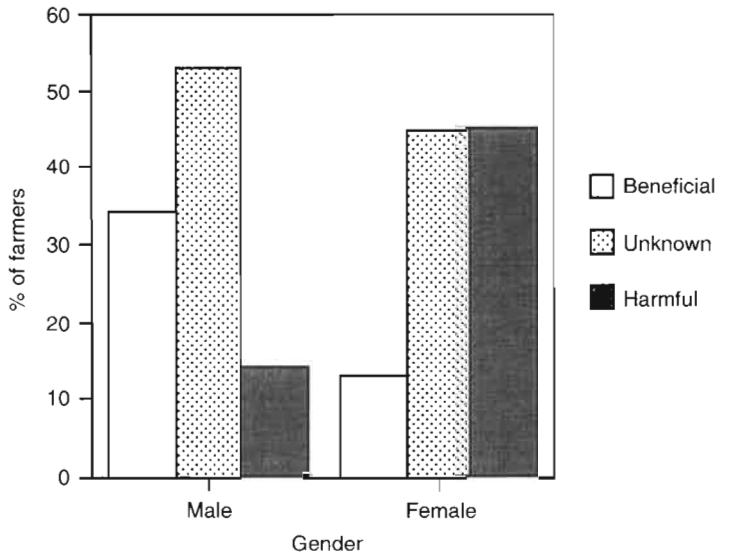

Fig. 8.2. Influence of gender on the perception of the role of earthworms in soil of indigenous farmers of eastern Mexico.

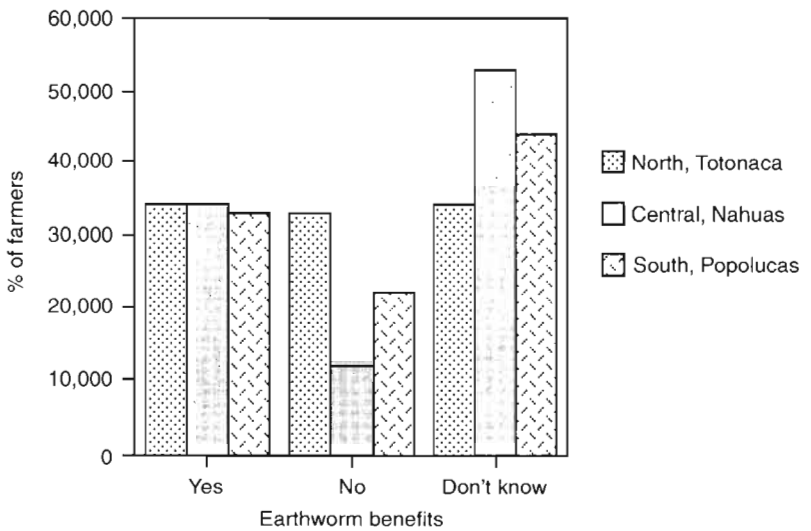

Fig. 8.3. Perception of the benefical effects of earthworms in cultivated soils of Veracruz, Mexico.

were ignorant), the centre group (44 farmers) was characterized by a more negative attitude since 22% of interviewed farmers considered earthworms unimportant or even harmful for the soil.

Traditional knowledge, myths and beliefs about earthworms

Traditional knowledge

In the four countries where the survey took place, farmers recognized the existence of three or four types of earthworms on the basis of size, colour and habitat. However, it was in Mexico where this knowledge was recorded in more detail. This was due mainly to the farmers' meetings, where 28 farmers and promoters from the three regions in which the survey was conducted discussed their opinions in depth. The dynamics of this workshop were based on the principles of exchange of information among participants (scientist–farmers and farmers–farmers).

It was therefore possible to obtain a traditional earthworm taxonomy from the three ethnic groups (Table 8.2). This is possibly the first report in the literature. This folk taxonomy for earthworms did not correspond to a scientific classification, because farmers considered different species under the same name (even from different origins: natives and exotics). The criteria used in the classification were colour, form and habitat, although these varied within each social group.

Farmers' knowledge of earthworms in Mexico is referenced in a book written in the 16th century by Martin de la Cruz entitled: *Libellus Of*

Table 8.2. Equivalence of earthworm knowledge between different southeastern Mexican indigenous groups and the western equivalent.

	Ethnic group		
English names	Totonacos	Nahuas	Popolucas
Earthworm	xpaluwa tiyat	tlalocuilin	toth
From within	xpa		
Worm	luwa	ocuilin	
Earth	tiyat	tlal	
Crop earthworm	xpaluwa katashawat		
Litter earthworm	xpaluwa tzozoco		
Orchard earthworm	xpaluwa kiljti		
Pasture earthworm		piitsaj	tlalocuilin
Sandy soil earthworm		xallalli	tlalocuilin
Swamp earthworm	bek tlalocuili	tuhuz toth	wuhiipiihnii
Yellow soil earthworm		tuhuz toth	puuhchnas
Red-neck earthworm	kechilti	tlalocuilin	
Black earthworm		tuhuz toth	yiknas

Medicinalibus Indorun Herbis (Folio 9V. Trad. 157) where the use of earthworms as healing agents of human cranium fractures is mentioned. Likewise, in the Florentin Codice (book 11 paragraph 13), eight different classes of worms are mentioned, including earthworms (tlalocuilin). We found no more information on the use of these organisms, and in general it can be said that in Mesoamerican literature there are very few written references on this topic (López Austin, personal communication)

Uses

In the Nahuas region (Zonglican Mountains, Veracruz), we recorded the existence of a medical practice that uses earthworms as spermaticides, as has been reported recently in China (Zhang *et al.*, 1992). Briefly, this practice considers that if a woman has sexual relations in the 40 days after giving birth, she must be cleaned with a medical preparation to avoid a worm infestation. After washing with arnica (*Zexmenia pringeli*, Greenm) water and itskuinyekatsolxiuitl (a wild herb, no identity) and dried off with clean cloth, the cervix should be impregnated with a previously heated oil solution (a mixture of bull fat, cochinimmas and earthworms, (preferently the red ones); the operation is repeated for 15 consecutive days, during which she must bathe in the Temaxcal. A temazcal is a small construction next to the house in which people take a steam bath (Isabel Ixatlahuac, Sierra de Zongoica, Veracruz, personal communication).

Beliefs

In the same region of Zongolica, people believe that feeding newborn children earthworms will preclude any sexual deviations in their subsequent development; children must be fed earthworms whose first and last seven segments have been removed (Isabel Montalvo Sierra de Zongolica, Veracruz, personal communication).

The following oral traditions about earthworms were also recorded in the Totonaca region of Papantla, Veracruz (Domingo Francisco Velazco, Fransico Sarabia, Papantla, Veracruz, personal communication):

- According to the belief of the Totonaca people, it is said that the earth organism is similar to the human organism and that earthworms are like the worms that live in the gut of man. Therefore, the earthworms are the world's gut that purify the earth. If earthworms die, the soil is lost.
- Men always have the queen worm (Xa tse Luwa) the one which helps to purify ingested food while eating; if that worm is expelled, the person could get sick and even die because there will be nothing to purify the food.
- When earth is given a personal status, there is the belief that worms live in the organism of earth and that they should live there to purify their organism and thus the earth will have good life and will provide good life to all of us that live on her.

In the same way, among Papantla farmers, there is a clear idea that earthworms are geophagous and that their excrement fertilizes the earth (Gerardo de la Cruz, Plan de Hidalgo, Papantla, Veracruz, personal communication). These beliefs correspond to what Aristotle said about earthworms, that they are the 'earth's intestines'.

Finally, by living within the soil, earthworms are considered 'daughters of Tlalocan' lord of the Earth (Nahuas from Mexico) or 'Cuica Mama' (Quechuas from Peru). They are placed in the upper levels of the terrestrial incarnations of superior forces that protect animals and plants (Heyden and Bauz, 1990). To Nahua people, therefore, they are considered the 'minor assistants' of Tlalocan, those that make vegetation grow and that maintain soil humidity (Manuel Orea, Zongolica, Veracruz, personal communication).

In summary, it is possible to recognize that rural knowledge (traced back to prehispanic roots) on the classification of earthworms and a valuation of their positive effects on annual crops exists among some Mexican indigenous groups. It could be said that for these groups earthworms constitute a symbolic bridge of fertility and health between man and nature.

Discussion

Recognition of the role of earthworms in soil fertility dates back to Egyptian and Greek times, when Aristotle mentioned their importance. More recently, Gilbert White (1789, quoted in Bouché, 1972) also considered earthworms to be the main promoters of vegetation, whereas Darwin's book (1881) constituted the first serious attempt to measure and evaluate the role of these organisms. In the first half of the 20th century, diverse investigations confirmed the important role that earthworm communities have had in soil formation as well as in the maintenance of its agricultural fertility. Perhaps the most outstanding statement comes from the US Department of Agriculture which stated in a 1949 report that: 'The investigations carried out in the Nile River Valley in the Sudan indicate that the great fertility of these soils is mainly due to the activity of earthworms. The observations and records carried out indicate that earthworm casting production during the activity period reaches values of 120 tons/acre/year' (Voison, 1974).

In spite of these antecedents, during the second half of this century soil fertility relied on external inputs more than on their inner biological components. As a consequence, traditional agricultural practices and knowledge of soil biota were overlooked.

As an illustrative example, traditional soil classifications were abandoned until recently when attempts have been made to recover this information. In Mexico, for example, this knowledge goes back to prehispanic time (Gibson, 1964) using a nomenclatural characterization of lands, whereas Williams (1977) indicated the existence of 45 classes of soils including those for both administrative and management purposes. Similarly, other ethnoedaphic

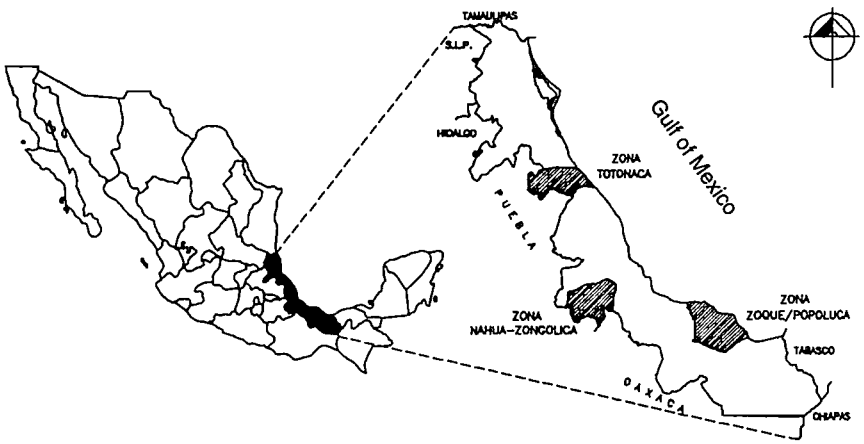

Fig. 8.4. Ethnological regions studied in Veracruz, Mexico.

researches (Barrera, 1988) have recognized that among indigenous Mexican peasants, soils are as important as other natural elements since they are 'all things sustaining'. From a classification point of view, the soils among the indigenous groups of Mesoamerica (Wilken, 1987; Barrera, 1988) are located in the first position of a hierarchical system that responds to the same logic of biological taxonomies (both in structure and in composition; Berlin, 1973). This important fact reveals that, within the farmers' indigenous classification, soils have the category of a 'life form', which means that the soil is viewed as a living entity.

Some of the data presented in this study supported this point of view. Thus we conclude that Mesoamerican knowledge about soils is at least four centuries more advanced than the current ideas about the relationships of soil organisms and soil fertility. Our results certainly suggest that in the remaining ancient knowledge of indigenous Mexican farmers, the soil and the animals inhabiting it are important factors indispensable to crop sustainability. This knowledge, unfortunately, was almost eliminated by Spanish conquerors.

Conclusions

Our findings suggest that indigenous farmers of Mexico, Peru and India consider earthworms as beneficial organisms for soil fertility. In the Congo, the small number of inquiries did not allow us to draw the conclusion that farmers do not care for these organisms. Moreover, in the Maalas system, women farmers could learn, once promoters explain this to them, how their traditional practice has favoured earthworms.

The general conclusion of this study is that, notwithstanding that some traditional knowledge exists, it is necessary to improve the education programme on soil biology, targeted at indigenous farmers. This programme

should take into account the particular perceptions and beliefs in each region in order to adapt the new technologies. In this sense, development workers can build on the judgement, intuition, knowledge and experimental capacity of local people.

Development will then take place as a local adaptation of exogeneous technologies and knowledge, and enhance the diversity in lifestyle and biological resources. With increasing recognition of the value and the need for working with local communities to identify, test, evaluate and disseminate new low-input technologies, various approaches will emerge (Haverkort and Millar, 1994).

For the near future, we need a radical change in the traditional ways of thinking about rural development. Indigenous peasant knowledge is often not seen by outsiders as valuable and valid in itself. It is seen as something to be taken into acount when introducing new technologies and concepts of development, whereas the main goal should be to find the best combination of elements of the indigenous system and the external system.

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Appendix 8.1.

SOCIOECONOMICAL STUDIES OF LOW INPUT AGRICULTURAL SYSTEMS IN RELATION TO EARTHWORM MANAGENENT PRACTICES

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Inquiry_____

DON'T USE CODIFICATION AREA

SOCEC QUESTIONARY

I. GENERAL DATA.

1. COUNTRY 5 (01. COLOMBIA, 02. CONGO, 03. COSTA DE MARFIL, 04. COSTA RICA, 05. INDIA, 06. MARTINICA, 07. MEXICO, 08. PANAMA, 09. PERU, 10. RUANDA) — 1 2
2. STATE Andhra Pradesh. (ITS NECESARY IDENTIFY THE NAMES OF THE STATE OR ADMINISTRATIVE-POLITICAL JURISDICTION WHERE THE INQUIRE IS APPLIED.) — 3 4
3. LOCALITY Secundrabad (ITS NECESARY IDENTIFY THE NAMES OF THE STATE OR ADMINISTRATIVE-POLITICAL JURISDICTION WHERE THE INQUIRE IS APPLIED.) — 5 6
4. ZONE South (CHARACTERISTICS IN RELATION TO FILE: EWDATABANK) — 7 8

II. INTERVIEWED PERSONAL DATA.

5. AGE (YEARS) 3 (1. UNDER 15; 2. FROM 16 TO 30, 3. FROM 31 TO 45, 4. FROM 46 TO 69, 5. OVER 61) — 9
6. SEX 2 (1.FEMALE; 2.MALE) — 10
7. LANGUAGES Telugu (1.SPANISH; 2.FRENCH; 3.VERNACULES; 4. OFICIAL AND VERNACULES; 5. ONLY VERNACULES) — 11
8. KIND OF FAMILY 1 (1.NUCLEAR; 2.EXTENDED; 3.WITHOUT) — 12
9. NUMBER OF RELATIVES LIVING IN THE SAME HOUSE 0 (1. 1 TO 3; 2. 4 TO 6; 3. 7 TO 9; 4. 10 TO 12; 5. 13 TO 15; 6 16 TO 18; 7. MORE THAN 19; 8. 0) — 13
10. ALPHABETIZATION 1 (1.LITERATE; 2. ILITERATE.) — 14

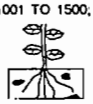
III. AGRONOMICAL DATA.

+11. AMOUNT OF CULTIVATED LAND (HAS) 2 (1.LESS THAN 1; 2 FROM 1 TO 5; 3 FROM 6 TO 10; 4 FROM 11 TO 12; 5.FROM 13 TO 15, 6.FROM 16 TO 25; 7 FROM 26 TO 50; 8. MORE THAN 51) — 15
12. KIND OF CULTURES 1 (1. ANNUAL FOR AUTOCONSUPTION; 2.ANNUAL FOR SALE; 3 PERENNE FOR AUTOCONSUPTION; 4. PERENNE FOR SALE) — 16
13.-CROP SPATIAL DISPOSITION 2 (1. MONOCULTURE; 2 POLICULTUPE) — 17
14.-SOIL RESTING PERIODS (YEARS) 1 (1. RESTLESS; 2 LESS THAN 1; 3.FROM 1 TO 2; 4 FROM 3 TO 5, 5 FROM 6 TO 10; 6 FROM 11 TO 15, 7 FROM 16 TO 25, 8 MORE THAN 25) — 18
15.-CONSECUTIVE YEARS OF CROP CULTIVATION (YEARS) 5 (1.FROM 1 TO 3; 2.FROM 4 TO 6; 3.FROM 7 TO 10; 4 FROM 11 TO 15; 5.MORE THAN 16) — 18
16.-KIND OF CATTLE 9 (1. BOVINE; 2.CAPRINE; 3.EQUINE; 4 MULES; 5.PIGS; 6.CORRAL BIRDS; 7.MIXED; 8.OVINE; 9. WITHOUT) — 19
+17.-NUMBER OF MAJOR HEAD CATTLES 7 (1 FROM 1 TO 5; 2.FROM 6 TO 10; 3.FROM 11 TO 15, 4 FROM 16 TO 30; 5 FROM 31 TO 45; 6 MORE THAN 45; 7. WITHOUT) — 20
+18.-AMOUNT OF SURFACE DESTINATED TO MAJOR CATTLE (HAS) 6 (1.FROM 1 TO 5; 2.FROM 6 TO 15; 3 FROM 16 TO 30; 4.FROM 31 TO 50; 5 MORE THAN 51, 6.WITHOUT) — 21
19.-PEST CONTROL 1 (1.CHEMICAL; 2. MECHANIC; 3. BIOLOGICAL; 4. MIXED; 5. NO PEST CONTROL) — 22
+20.-FERTILIZER USE 1 (1.CHEMICAL; 2. GREEN MANURE; 3. INCORPORATION OF STUBBLE; 4. INCORPORATION OF ANIMAL MANURE; 5.MIXED; 6. NO USE) — 23
21.-IRRIGATION CONTROL 1 (1. WATER RUNNING BETWEEN FURROWS, 2 MANUAL; 3. ASPERSION; 4.TEMPORAL RAIN FALL; 5. OTHERS; 6.NO IRRIGATION) — 24

Appendix 8.1. *Continued*

22.-KIND OF TILLAGE 2 (25)
(1 MANUAL; 2.WITH ANIMALS, 3 MECHANICAL; 4 MIXED)
23.-WEED CONTROL 1 (26)
(1.MANUAL; 2 MECHANICAL; 3.CHEMICAL; 4 MIXED; 5.NO CONTROL)
24.-UTILIZATION OF HARVEST REMANENT 2 (27)
(1 BURNED IN THE FIELD; 2 LEFT IN THE FIELD, 3 INCORPORATED TO SOIL, 4 USED LIKE FOOD CATTLE; 5 USED LIKE ENSILES; 6.MIXED)
25.-CROP ROTATION Nb (28)
(1 YES; 2 NO)
26.-YIELD OF PRINCIPAL CROP (KG/HA) 3 (29)
(1.FROM 1 TO 20; 2.FROM 21 TO 100; 3.FROM 101 TO 500; 4 FROM 501 TO 1000; 5 FROM 1001 TO 1500; 6 FROM 1501 TO 2000; 7. FROM 2001 TO 3000; 8. FROM 3001 TO 4000; 9. MORE THAN 4001)
27.-YIELD OF SECONDARY CROP (KG/HA) 2 (30)
(1.FROM 1 TO 20; 2.FROM 21 TO 100; 3.FROM 101 TO 500; 4 FROM 501 TO 1000; 5 FROM 1001 TO 1500; 6. FROM 1501 TO 2000; 7.FROM 2001 TO 3000; 8 FROM 3001 TO 4000; 9 MORE THAN 4001)

IV.-ETHNOEDAPHOLIGICAL AND ETHNOBIOLOGICAL SOIL DATA



◆28.- AMOUNT OF SOILS RECOGNIZED X (31)
(1.1; 2 2; 3 FROM 3 TO 4; 4.FROM 5 TO 7; 5.FROM 8 TO 10; 6.FROM 11 TO 15; 7.FROM 16 TO 20; 8 FROM 21 TO 25; 9. ANY ONE)
◆29.-PRINCIPAL CRITERION OF SOIL CLASIFICATION 1 (32)
(1.COLOR; 2.TEXTURE; 3.STONY; 4.PROFUNDITY, 5.TOPOGRAPHY; 6 INFILTRATION DEPTH; 7.PRESENCE OF ANIMALS LIKE EARTHWORMS, ANTS, TERMITES, 8.ORGANIC MATTER; 9 DONT'N KNOW)
◆30.-PRINCIPAL CRITERION OF SOIL FERTILITY 3 X 4 (33)
(1.TEXTURE; 2.DEPTH; 3 ORGANIC MATTER, 4.PLANT INDICATORS; 5 OTHERS, 6 DONT'N KNOW)
By seeing the growth of the plant we can say the soil is good
31.-SOIL VERTEBRATE RECOGNIZED 5 (34)
(1.FROGS; 2 BADGERS; 3.RATS; 4.OTHERS, 5.ANY ONE)
32.-SOIL INVERTEBRATE RECOGNIZED 5 (35)
(1.EARTHWORMS; 2.ANTS; 3.TERMITES; 4.OTHERS, 5.ANY ONE)
◆33.- EARTHWORMS RECOGNIZED 6 (36)
(1 1; 2 2; 3 FROM 3 TO 4; 4 FROM 5 TO 6; 5 MORE THAN 6)
◆34.-PRINCIPAL CRITERION OF EARTHWORM IDENTIFICATION 1 & 3 (37)
(1.SIZE; 2 COLOR; 3 RESIDENCE PLACE; 4 LIFE CYCLE, 5 ASOCIATION TO NATURAL PHENOMENON; 6 OTHERS; 7. ANY ONE)
35.- EARTHWORM PREDATORS 2 & 3 (38)
(1.FROGS; 2.BIRDS; 3 SMALL MAMMALS, 4.OTHERS, 5.ANY ONE)
36.-ARE THE EARTHWORM BENEFICAL TO SOIL FERTILITY? 3 (39)
(1 YES, 2.NO; 3.HE (SHE) DOESN'T KNOW)
37.-ARE THE EARTHWORM HARMFUL TO SOIL FERTILITY? WHY? 3 (40)
(1.YES, 2.NO; 3.HE (SHE) DOESN'T KNOW)

Appendix 8.1 *Continued*

38.-HAVE EARTHWORMS SOME USE? 7 41
(1.ALIMENTARY; 2 MEDICINAL; 3 RITUAL; 4.ORNAMENTAL; 5 RELIGIOUS; 6.OTHERS; 7.BAIT; 8.THEY ARE NOT USED; 9.HE DOESN'T KNOW)
for catching fish

39.-BEHAVIOUR TOWARDS EARTHWORMS 2 42
(1.TO PROMOTE THEM; 2. TO KILL THEM; 3.NOTHING)

V.SOCIOECONOMICAL DATA.

40.-LAND TENURE 2 43
(1.PRIVATE; 2.STATE; 3.COMMUNITY; 4.RENTED; 5 LEND; 6.MIXED; 7.IN JURIDICAL LITIGATION; 8 OTHER)
41.-KIND OF WORKMANSHIP 2 44
(1.FAMILIAR; 2.SALARIED; 3 COMMUNALITY; 4 MIXED; 5 OTHER)
42.-INSTITUTIONAL SUPPORT FOR PRODUCTION 6 45
(1.COOPERATIVE; 2.STATE CREDIT; 3.BANK CREDIT; 4 INTERNATIONAL DEVELOPMENT AGENCY; 5.OTHERS; 6.NO EXTERNAL SUPPORT)
43.-PRODUCTION DESTINATION 1 46
(1.AUTOCONSUPTION; 2.SALE; 3.BOTH)
44.-PRODUCTION COST OF PRINCIPAL CROP SINCE SEEDING, INCLUDING INPUTS LIKE FERTILIZER, PESTICIDES, SEEDS, TRACTOR, WEEDING CONTROL, HARVEST AND STORAGE (DOLLAR/HA) 3 47
(1.FROM 1 TO 20; 2.FROM 21 TO 50; 3. FROM 51 TO 100; 4.FROM 101 TO 500; 5.FROM 501 TO 1000; 6.MORE THAN 1001)
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(1.FROM 1 TO 20; 2.FROM 21 TO 50; 3.FROM 51 TO 100; 4.FROM 101 TO 500; 5.FROM 501 TO 1000; 6.MORE THAN 1001)
46.-INCOMES FROM SALE OF AGRICULTURAL PRODUCTS (DOLLAR/CYCLE) 5 49
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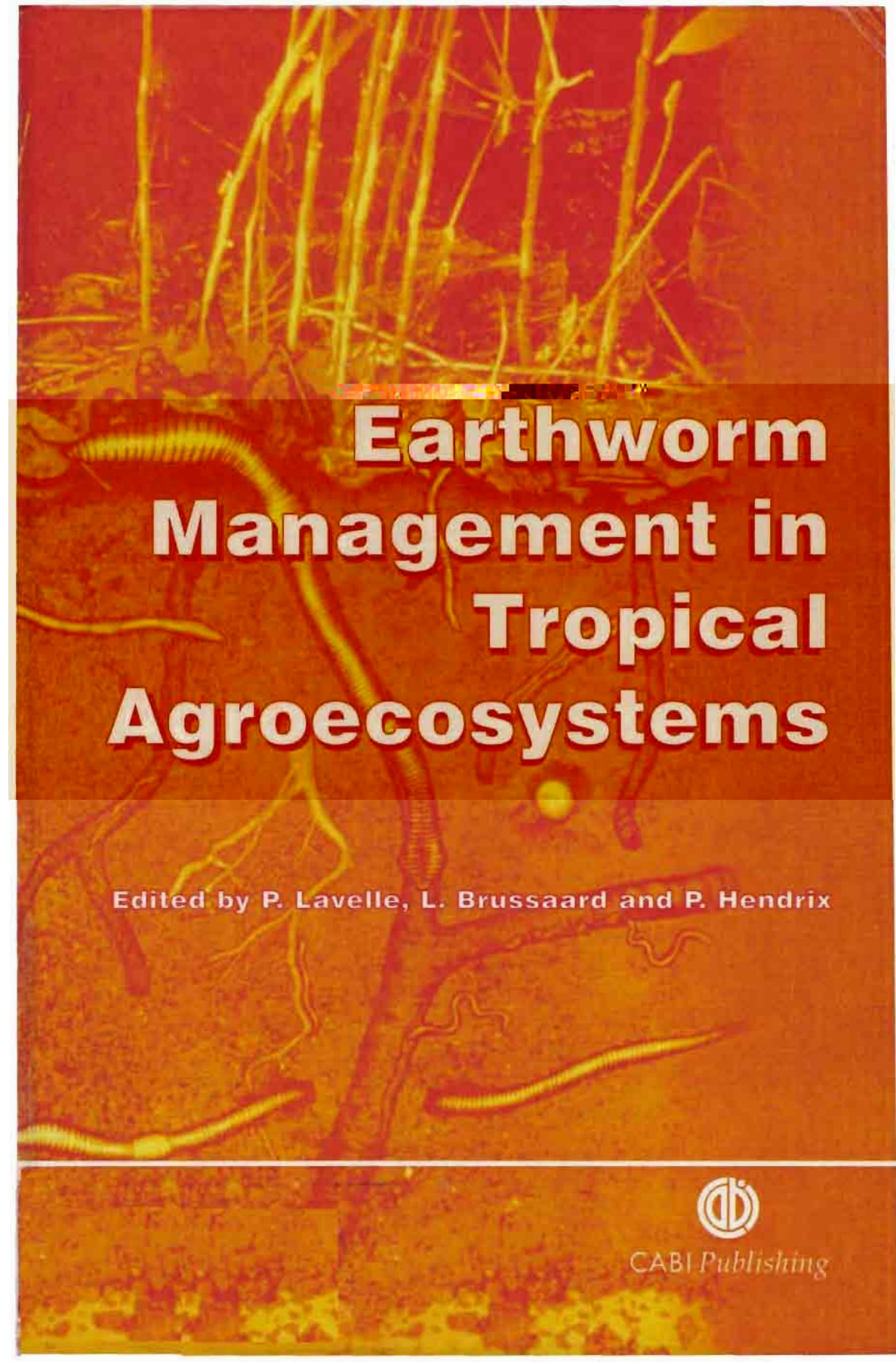
(1.FROM 1 TO 5; 2.FROM 6 TO 10; 3.FROM 11 TO 15; 4 FROM 16 TO 20; 5.FROM 21 TO 50; 6.FROM 51 TO 100; 7.FROM 101 TO 500; 8.FROM 501 TO 1000; 9. MORE THAN 1000)
48.-OTHER ECONOMIC INCOMES X 51
(1.WORKMANSHIP'S SALE; 2.HANDCRAFT'S SALE, 3 FOOD PROCESING; 4.OTHERS)

49.-RECOPILATION OF BELIFS, HISTORIES AND MYTHS RELATED TO SOIL FERTILITY AND EARTHWORMS.

INTERVIEWERS NAME Mr. Chandrakani (Driver)
DATE 5.2.96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