Understanding Traditional Agriculture: Bibliography for Development Workers

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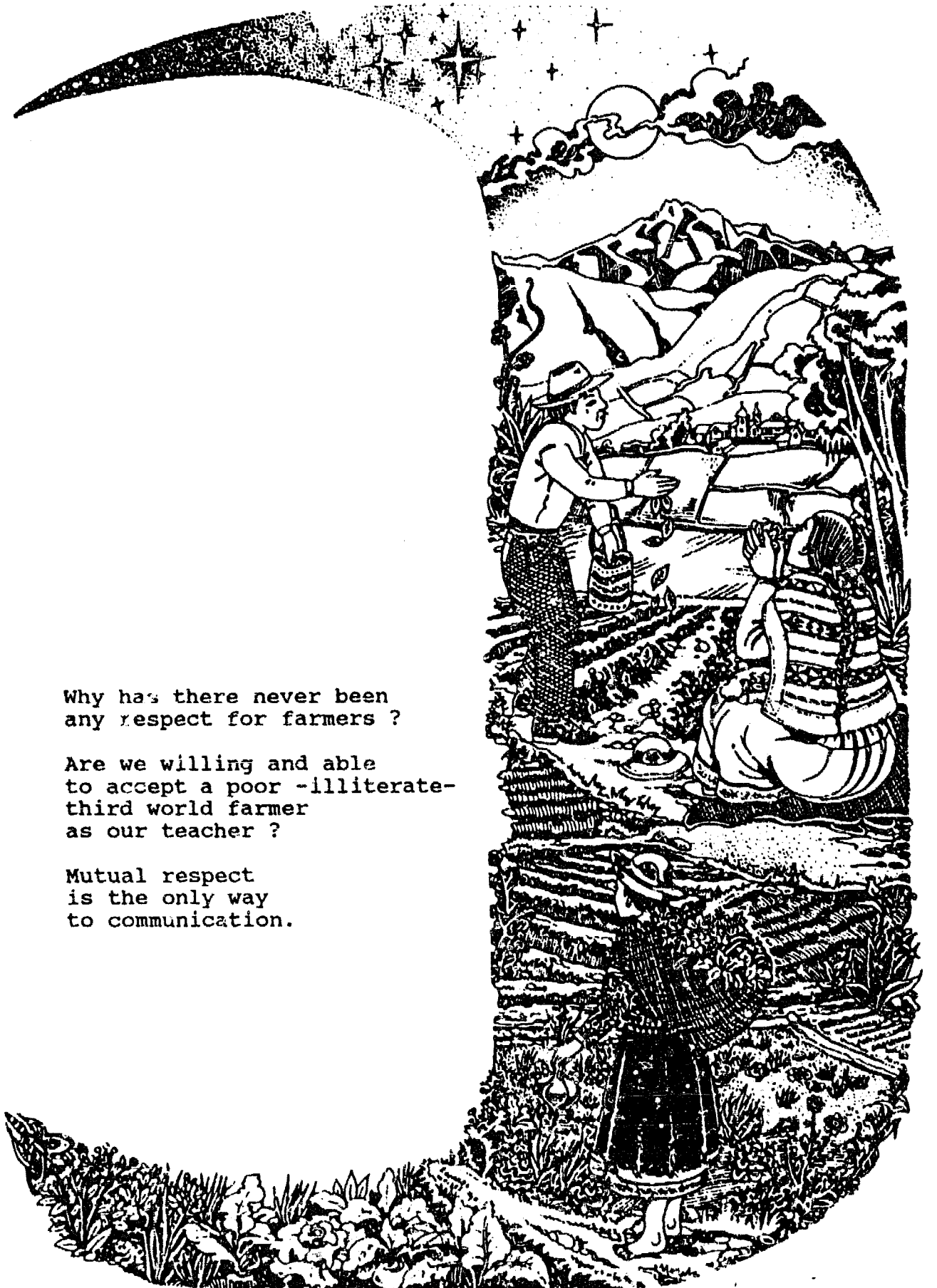
UNDERSTANDING TRADITIONAL AGRICULTURE

Foreword

Here are the results of a first attempt at surveying the literature available on traditional agriculture.
ILEIA views this undertaking as a logical extension of the task to collect information about traditional non-western farming systems, and make this information available to extensions workers in the Netherlands and in Third World countries.
It is especially noteworthy that Third World extension workers often encounter difficulties in obtaining the results of those studies which are carried out by Westerners in their countries.

ILEIA hopes that by publishing this sort of bibliography, and by collecting and circulating discussionpapers and basic literature about traditional agriculture in all parts of the world, to arrive at a more democratic exchange of information and technology.
If we want to achieve a humanely - and ecologically - friendly agriculture in this world, we must strive to learn a great deal from the practical farmers.
ILEIA would like, therefore, to request the help of everyone in collecting this literature about traditional agricultural systems in the world. We promise to inform you regularly about this theme in the ILEIA Newsletter.

ILEIA, Leusden,
November, 1986.



Why has there never been
any respect for farmers ?

Are we willing and able
to accept a poor -illiterate-
third world farmer
as our teacher ?

Mutual respect
is the only way
to communication.

MINKA. GRUPO. TALPUY PERU

Introduction

Peasants all over the world have developed their own forms of farming to survive. This has come about within the framework of local possibilities and limitations of ecology and within the social, economic and political structure of their countries and the whole world. It is no wonder, then, that there are a thousand and one different agricultural systems.

In addition, we know that three-fourths of all farming families are scarcely in a position to buy machinery, fertilizers, insecticides, or hybrid seeds. Therefore there are that many farming families who live from more-or-less traditional "low external input" agriculture.

If we want to cooperate on development with this large sector, it is logical that we first ground ourselves in the knowledge and experience that they already have. Only then we can work together to solve the bottlenecks which stand in the way of their further development.
Much too often we then must confront problems such as the sharing of power--not only in regard to the means of production such as land, water, labour, and equipment--but also in regard to who has the power over development programs, education, and scientific research.

The literature collected here shall certainly help us with discussions about the importance of traditional agriculture, and give us insight into the bottlenecks which are involved in its development.
I have sought out literature which supports my experience in Latin America where, with my wife Anneke, I lived for 10 years. We worked in various development projects attempting to improve the food, food production, and health of the Andes people, because we see agriculture as an integrated part of a farmer's subsistence. Therefore, I have included various texts which deal with the nutrition and health aspects which pass the same problems in their development as agriculture.

Furthermore, I have searched for descriptions, inventories and case-studies about traditional agriculture from different parts of the world. Especially among the social sciences such as anthropology I have found detailed descriptions. Although these do not always explore deeply the technical aspect, they still provide helpful insight into other farming cultures.

With regard to South America, I have, in addition to the general literature, split the subject into two clearly defined ecosystems: the Andes mountains and the Amazon region. These specific farming cultures do not conform to political boundaries.

Unfortunately I must finish this first research because of limitation of time and money. However, I find it very important that with this publication it is now possible to make contact with people who are interested in tackling this problem in a more structural way.

I am glad that ILEIA wishes to continue the systematizing of this sort of literature. Hopefully everyone interested in this subject will help as well.

The intention of ILEIA is not to collect documents in order to fill up a library, but it sees its task as one of giving information about <u>where</u> development workers can find literature relevant to their work. Therefore I have, where possible, included information about where articles and books are published, and where they are available in the Netherlands. Addresses of more specialized libraries and information centers in the Netherlands can be found elsewhere in this booklet.

My wish is that this bibliography is expanded by insiders from <u>every</u> country. The titles which I have found only form the top of an iceberg of information. It appears that there must be literature about traditional agricultural systems in every country In any case, we can try to unlock, through these titles, other literature sources, and feel inspired with ideas from other parts of the world.

Although for most people the easiest method of becoming familiar with farmers' knowledge and experience is through literature, one must realize that much of that literature is written from a Western perspective by predominantly Western researchers. As development workers, we cannot afford to let this be. We must strive for very intensive communication with farming families in order to learn together to understand, systematize, and improve the reality of their agricultural traditions. The scientist must link up with the practical experience of farmers, so that he/she can understand their behaviour. I know for sure that we shall find a great deal of knowledge and experience among farmers which will contribute greatly to our projects.
If we take the standpoint that it is the people themselves who develop, it is obvious that we, as development workers, must familiarize ourselves with what the people themselves know and do. This is necessary before we can speak of "development cooperation". The greatest stumbling block for many of us is to be able to recognize the illiterate, "underdeveloped" Third World farmer and farmerswife as a resource of knowledge and wisdom.
I don't stop to believe in a better future.

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Traditions are the roots of a culture.

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THE QUESTION OF SMALL FARM DEVELOPMENT:

Who Teaches Whom ?

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About 60% of the world's cultivated land is still farmed by traditional or subsistence methods. Polycultures are a prevalent component of these systems. For example, in the Latin American tropics 60% of the corn is grown intercropped. Similarly, in Africa 98% of the cowpea, the most important legume there, is grown in association with other crops (Francis et al., 1976). These systems, however, have been regarded as 'primitive' by western agriculturalists. This conception has lead to the attitude that the existing food production problems in underdeveloped countries are due to the fact that local farmers are incapable of coping with crop production processes and that modern technologies from the temperate zones must be imported to promote suitable solutions.

Thus, in the early seventies the international network of agricultural research centers extended very rapidly. The mission was the spread of the 'Green Revolution' through the development of high-yielding varieties of wheat, rice and other cereals. Or, in other words, accumulated technical information developed over the past decades in the west was to be modified and applied to crop production in the developing countries. Naturally, the new plants were specifically bred to further the type of capital intensive grain production systems desired by Western interests, thus opening new markets for agri-business (Perelman, 1977). Unfortunately, the Green Revolution proponents did not forsee the consequences of importing 'technological packages' that had been formulated under very different ecological and socio—economic conditions. In fact, most agronomic recommendations proved to be seriously unfit to the heterogeneous characteristics of the peasants' ecology and economy (de Janvry, 1981).

Contrary to expectations, no significantly new technological packages capable of yielding increased net returns could be offered to the majority

of peasants. The new packages failed to take into account the features of subsistence agriculture — ability to bear risk, labor constraints, symbiotic crop mixtures, diet requirements, etc. — that determine the management criteria and levels of resourc use by local farmers. In the majority of cases, new varieties could not surpass local varieties when managed with traditional practices (Perelman, 1977). The areas where the new 'miracle cereals' were widely adopted were haunted by disease epidemics. Plant breeders soon learned that planting a whole region with genetically similar varieties led to the danger of disastrous attack by either insect pests or diseases (Adams et al., 1971). Other peasants soon abandoned the new varieties because of added expenses in the production (de Janvry, 1981). For example, most small farmers could not afford the expense of a tube well in order to have irrigation, an essential component of the new technology (Perelman, 1977). Thus, it seems that only a small proportion of farmers benefited from the Green Revolution.

REVERTING AGRICULTURAL DEVELOPMENT STRATEGIES

Today, it is becoming very apparent that most of the rural-development programs are highly contradictory, because formulating Western models among a peasant community proves inappropriate. This overwhelming conclusion has prompted a re-examination and re-orientation of many research and extension programs, so that recommendations are consistent with the circumstances of farmers. Recently, results of studies by scientists working in farmers' fields suggest that the only way to formulate technology appropriate and adaptable to farmer's criteria and resource base is by analyzing the socio-economic and biophysical constraints of farm production (Harwood, 1979). This requires both an ecological and economic approach which formalizes the body of complex relationships implicit in traditional farm systems. It also requires a change in attitude so that traditional subsistence agro-ecosystems are no longer regarded as 'primitive' and as the product of ignorance, but rather as the product of ecological rationales, and when considered within the historic framework of their origins, these are virtually optimal agricultural systems (Egger, 1981). This renewed view of the agrarian question is starting to reveal that the hunger and malnutrition problems that plague the developing world are not due to the incapacity of the small farm sector, but to problems of institutional support, credit and marketing, and definitely to inequalities in the distribution of income and food (Lappe and Collins, 1977). Thus, at this stage, the question of agrarian development, besides being technical, is fundamentally a question of social and structural changes.

ECOLOGICAL FEATURES OF TRADITIONAL AGRICULTURE

Understanding farmers' existing technology and farming systems is the fundamental step in the design of appropriate development strategies. Per-

haps one of the most salient features of traditional farming systems in most developing countries is their degree of crop diversity both in time and space. This diversity is expressed through the use of multiple cropping systems or polycultures. The practice of polycultures is a traditional strategy to promote diversity of diet and income source, stability of production, minimization of risk, reduced insect and disease incidence, efficient use of labor, intensification of production with limited resources and maximization of returns under low levels of technology (Francis et al., 1976; Harwood, 1979).

Polycultures exhibit a number of desirable features of socio—economic stability, biological resilience and productivity. The following is a list of the many advantages offered by polycultural systems as compared to monoculture agriculture as practiced in modern countries (Ruthenberg, 1976):

(a) total yields per hectare are often higher than the sole crop yields even if yields of individual components are reduced;

(b) mixtures result in more efficient utilization of resources (light, water, nutrients) by plants of different height, canopy structure and nutrient requirements;

(c) diseases and pests may not spread as rapidly in mixtures because of differential susceptibility to the pests and pathogens and because of enhanced abundance and efficiency of natural enemies;

(d) they provide insurance against crop failure, especially in areas subject to frosts, floods or droughts. For example, in the highlands of Tlaxcala, Mexican farmers intercrop corn with fava beans, because fava beans survive frosts, whereas corn is completely burned;

(e) they enhance opportunities for marketing ensuring a steady supply of a range of products without much investment in storage, thus increasing the marketing success;

(f) they provide effective cover to the soil and reduce loss of soil moisture;

(g) mixtures spread labor costs more evenly throughout the cropping season, and usually give higher gross returns per unit of labor employed, especially during labor scarcity periods;

(h) in cereal/legume mixtures, fixed nitrogen from the legume is available to the cereal and the nutritional quality of the mixture is improved;

(i) mixtures in component gardens constitute experimental plots for screening exotic materials and preservation of germplasm;

(j) the shading provided by complex crop canopies helps to suppress weeds, thereby reducing the need and cost of weed control; and

(k) in mixtures a better nutrient cycling usually results. Minerals left by certain annuals are taken up by others, and the nutrient-robbing propensity of some crops is counteracted by the enriching addition of organic matter tc the soil by others.

IMPLICATIONS FOR MODERN AGRICULTURE

High yields in modern agricultural systems are sustained by investing costly external resources of uncertain future availability. The development

of modern agricultural production has been achieved by creating large-scale, specialized farm production units, and increased mechanization and use of chemical inputs. Thus, gains in crop yield directly depend on intensive management and on the uninterrupted availability of energy and resources. Generally, increases in yields have been accompanied by a decline in genetic variability, natural soil fertility, biological pest regulation, enhanced soil erosion, and salinization and other environmental problems. Thus the development of alternative, self-sustained, energy efficient and less resource-intensive farming systems is desirable.

Understanding traditional cropping schemes, which are the result of a long selection pro ess, may reveal important ecological clues for the development of alternative production and management systems. Through research, many alternative management systems have emerged. These include multiple cropping systems, agroforestry, minimum tillage, cover cropping and living mulches. In the design of such systems it should always be kept in mind that the goal is not short-term maximization of yield, but rather stabilization of yield with the most efficient utilization of energy and of non-renewable resources, and a minimal degree of ecosystem degradation. This is the strategy of the small tropical farmer who has managed to survive under conditions of low-quality marginal soils, low capital and no access to institutional support. Through a 'learn from the farmers' approach (Saint and Coward, 1977), the advantages of such a strategy are only now becoming apparent to Western agriculturalists. This view represents a reversal of the conventional agrarian development strategy; namely, the poor but efficient teaches the opulent but wasteful.

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Traditional Agriculture in India: High Yields and No Waste

by Bharat Dogra

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Today in India, as in many other developing countries with a rich agricultural tradition of their own, the words 'improved agriculture' and 'progressive agriculture' have become synonymous with the spread of HYVs (High Yielding Varieties of Crops) grown with ever-increasing doses of (often imported) chemical fertilisers and pesticides. Wherever the new crop varieties have spread, time-honoured crop rotations, inter-cropping patterns and other important features of traditional agriculture have been harshly uprooted (this choice, however, has not been made willingly by most farmers, rather it has been forced on them by a package of government policies, subsidies and selective price incentives).

At the back of this trend, and the official policies which support it, is the belief that traditional agriculture is 'backward' and incapable of meeting the desired objectives of agricultural planning, i.e. making adequate food available for the Indian masses and improving the living conditions of the peasants who constitute the overwhelming proportion of the Indian population.

But is this belief, widespread as it is among several international 'experts' and India's own development planners and policy makers, supported by hard facts?

In 1889, Dr John Augustus Voelcker, the Consulting Chemist to the Royal Agricultural Society of England, was sent by the British government to study Indian agriculture. Voelcker toured the country extensively for over one year. His report was published in 1893, and since then has often been cited as an authoritative work on Indian agriculture of this period. For instance, the Report of the Royal Commission on Agriculture (1928) said of the Voelcker Report, "Although thirty five years have elapsed since this work was written, the ability which Dr Voelcker displayed in his comprehensive survey of the agricultural conditions of India, in his analysis of problems they present and in the recommendations for their solution, still renders it a book of the utmost value to all students of agriculture in India."

How did Dr Voelcker view Indian agriculture as it existed nearly a hundred years back? Did he consider it backward and incapable of giving a good yield? The essence of what Dr Voelcker said can be summarised in the following extract from his report: "I explain that I do not share the opinions which have been expressed as to Indian Agriculture being, as a whole, primitive and backward, but I believe that in many parts there is little or

nothing that can be improved, whilst where agriculture is manifestly inferior, it is more generally the result of the absence of facilities which exist in the better districts than from inherent bad systems of cultivation ... I make bold to say that it is a much easier task to propose improvements in English agriculture than to make really valuable suggestions for that of India ... the conviction has forced itself upon me that, taking everything together and more especially considering the conditions under which Indian crops are grown, they are wonderfully good. At his best the Indian raiyat or cultivator is quite as good as, and in some respects, the superior of, the average British farmer, while at his worst it can only be said that this state is brought about largely by an absence of facilities for improvement which is probably unequalled in any other country ... I have remarked in earlier chapters about the general excellence of the cultivation; the crops grown here are numerous and varied, much more indeed than in England. That the cultivation should often be magnificent is not to be wondered at when it is remembered that many of the crops have been known to the raiyats for several centuries, rice is a prominent instance in point."

More especially he stated, "To take the ordinary acts of husbandry, nowhere would one find better instances of keeping land scrupulously clean from weeds, of ingenuity in device of water-raising appliances, of knowledge of soils and their capabilities as well as of the exact time to sow and to reap, as one would in Indian agriculture, and this not at its best alone, but at its ordinary level. It is wonderful, too, how much is known of rotation, the system of mixed crops and of fallowing. Certain it is that I, at least, have never seen a more perfect picture of careful cultivation, combined with hard labour, perseverence and fertility of resource, than I have seen at many of the halting places in my tour. Such are the gardens of Mahi, the fields of Nadiad and many others."

Voelcker did not believe that the existing ploughs and other implements used by the farmers were useless and ready to be replaced, "It has been said that if the native cultivator had 'improved' ploughs he could dispense with the many ploughings which he gives to the land, and that he would thus save himself the cost of going over the field again and again, crossing and recrossing. These ploughings are always three or four in number for ordinary crops, and eight, twelve and even as many as twenty, for sugar cane and other special crops. But the answer is that the end is achieved in time, a finer and better tilth is obtained and the moisture is not lost." Further, "If for ploughs of new designs there be but little room, still less is there for more expensive implements, such as seed-drills, mowers, reapers, threshing machines etc. The native seed drill will strike everyone who sees it at work as being wonderfully efficient, and leaving little to be desired ... Anyone, who has watched the clever devices of the native cultivators in the implements which they use, for harrowing, levelling, drilling, raising water, etc.,

will see that if anything is to replace the existing implements it must be simple, cheap and effective. He will indeed be a clever man who introduces something really practical."

An important agent of traditional Indian agriculture was the well-developed irrigation system. "Irrigation by wells is at once the most widely distributed system, and also the one productive of the finest examples of careful cultivation ...
Further, as regards wells, one cannot help being struck by the skill with which a supply of water is first found by the native cultivators, then by the construction of the wells, the kinds of wells and their suitability to the surroundings and means of the people; also by the various devices for raising water, each of which has a distinct reason for its adoption. All these are most interesting points with which I am not called upon to deal, for I see little to improve in them which the cultivator does not know perfectly well."

Another aspect, less widely realised, was that of a scientific rotation system. Voelcker pointed out, "It is quite a mistake to suppose that rotation is not understood or appreciated in India. Frequently more than one crop at a time may be seen occupying the same ground but one is very apt to forget that this is really an instance of rotation being followed. It is not an infrequent practice, when drilling a cereal crop, such as jowar (sorghum vulgare) or some other millet, to put in at intervals a few drills of some leguminous crop, such as arhar (cajanus Indicus) ...

"There are many systems in ordinary use which are far more complicated than the above. For instance, not only may there be rows of crops, side by side, as noticed above, but the alternating rows may themselves be made up of mixtures of different crops, some of them quick growing and reaped early, others of slower growth and requiring both sun and air, and thus being reaped after the former have been cleared off. Again, some are deep-rooted plants, others are surface feeders, some require the shelter of other plants and some will thrive alone. The whole system appears to be one designed to cover the bareness and consequent loss to the soil, which would result from the soil beating down upon it, and from the loss of moisture which it would incur."

Voelcker, moreover, was not the only agricultural scientist to point out these assets of traditional agriculture in India. There were several others, scientists and expert scholars, who did so. Here we quote from only two others-J. Mollison and A.O. Hume.

J. Mollison, who later became the first Inspector General of Agriculture in India, published in 1901 a volume Text Book of Indian Agriculture. Like Voelcker, Mollison stressed the suitability of the implements used traditionally in Indian conditions. "I believe that the implements in ordinary use are entirely suitable for the conditions of Indian agriculture. This statement may be objected to by other authorities, but if such is the case, I am afraid, I cannot change a deliberately expressed opinion. To those who are sceptical I can show in parts

of the Bombay Presidency cultivation by means of indigenous tillage implements only, which in respect of neatness, thoroughness and profitableness cannot be excelled by the best gardeners or the best farmers in any part of the world. That statement I deliberately make, and am quite prepared to substantiate."

Mollison gives the following account of the practice of artificial warping in Bombay Presidency,"Artificial warping differs from the natural formation of alluvium only, in that the water of a turbid stream may be diverted from its course, and held in a particular area sufficiently long to deposit a large amount of sediment, and if the process is often repeated, a soil of considerable depth may be formed on rock or any other sterile area. Many of the small rice-fields on the Western Ghats have been formed by throwing bandheras across the turbid hill-streams and either diverting the water or allowing a small lake to form above the weir. In this way the current is so obstructed that suspended earthy matter is deposited and in time the silt layer becomes so deep that a rice-crop can be raised theron. The lower terraced rice fields of the Ghats are annually warped and improved by the silt carried down by the drainage water of the uplands."

Speaking of the soil-mixing practices, Mollison writes, "Mixing is not unknown in India. Clay is often carted from rice-fields in sufficient quantity to add a layer one to two inches thick on sand land. The addition changes the consistence of the sand, so that it becomes better suited for sugar cane and other garden crops raised under irrigation. The cultivator appreciates the value of tank silt and in those districts where these water reservoirs are common they are cleaned out with the utmost care and regularly each year. The silt which has collected in these tanks being the washings of village sites and cultivated fields, has some manurial value, and applied as it is at the rate of 40 cart loads or more per acre, adds considerably to the body of soil."

A.O. Hume, in Agricultural Reform in India, (1878) wrote about weed-control by Indian farmers at that time, "As for weeds, their wheat fields would, in this respect, shame ninety-nine hundredths of those in Europe. You may stand in some high old barrow-like village site in Upper India, and look down on all sides on one wide sea of waving wheat broken only by dark green islands of mango groves-many square miles of wheat and not a weed or blade of grass above six inches in height to be found amongst it. What is to be spied out creeping here and there on the ground is only the growth of the last few weeks, since the corn grew too high and thick to permit the women and children to continue weeding."

Hume's tribute to the grain-storage practices of Indian farmers is no less glowing. "They are great adepts in storing grain, and will turn out of rough earthern pits, after 20 years, absolutely uninjured. They know the exact state of ripeness to which grain should be allowed to stand in different seasons; in other words under different

meteorological conditions, to ensure its keeping when thus stored; and equally the length of time that, under varying atmospheric conditions it should lie upon the open threshing floor to secure the same object."

All these statements were made in the latter part of the 19th century, but more recent research on tribal communities and other farmers following traditional methods of cultivation has also revealed several interesting facts about the assets of traditional agriculture.

Research work done during the last decade by a prominent agricultural scientist of India, Dr R.H. Richaria (former Director of Central Rice Research Institute in India) in the Chattisgarh region of the state of Madhya Pradesh has revealed the high level of skills of the farmers of remote tribal villages still untouched by the official development programmes. This scientist's travels in Bastar district, one of the most remote areas in Central India, where tribal communities still lead a life of their own, brought him into contact with farmers who were taking comparable and even larger yields from indigenous rice varieties, compared to the HYVs being spread officially in other parts of the state. Another revelation was the very large number of rice varieties being grown by the farmers, who possessed detailed knowledge of each of their properties. Some of those varieties were remarkable for their high yields, some for their supreme cooking qualities, some for their aroma, and some for other cherished qualities.

In the late seventies, Dr Richaria wrote:'A recent varietal cum agronomic survey has shown that nearly 9 per cent of the total varieties grown in MP fall under the category of high yielding types (3,705 kgs and above per hectare).

A farmer planting a rice variety called Mokdo of Bastar who adopted his own cultivation practices obtained about 3,700 to 4,700 kgs of paddy per hectare. Another rice grower of Dhamtari block (Raipur) with just one hectare of rice land, told me that he obtained about 4,400 kgs of paddy per hectare from chinnar variety, a renowned scented type, year after year with little fluctuations. He used farmyard manure supplemented at times with a low dose of nitrogen fertilisers. For low lying areas in Farasgaon Block (Bastar) a non-lodging mildly scented tall rice variety Surja with bold grains can compete with Java in yield potential at lower doses of fertilisation, according to a local grower who recently showed me his crop. During my visit to the Bastar area in the middle of November, 1975, when the harvesting of new rice crop was in full swing in that locality, I observed a field of Assam Chudi ready for harvest with which the adivasi cultivator named Baldeo of the Bhatra tribe in the village Dhikonga of Jugalpur block, had entered in a crop competition. The cultivator had applied fertiliser approximately equal to 50 kg N/ha and had used no plant protection measures. He expected a yield of about 5,000 kg/ha.

In the Bichia Block of the

Mandla district. Madhya Pradesh, our survey (1973-74) has indicated the following yields:

Indigenous rice variety	Yield in acre (1 bag=75 kgs)	Yield in kg/ha
1.Amar Jyoti	20	3750
2. Rani Kajar	30-35	5625-6562
3. Chattri	20	3750
4. Dubraj	20-25	3750-4687
5. Luchai	30-35	5625-6562

Dr Richaria stresses that the existing local practices of cultivation have emerged after centuries of experience, based on trial and error and have a sound basis for their wide acceptance.

While studying traditional agriculture, attention should not be focused only, or even primarily, on farming methods and on crop varieties. What is more important is the overall harmony of the traditional mixed farming system.

Traditionally, man, animals, trees (including grasslands) and agricultural fields were inseparable and harmonious components of a single system. The villager looked after the trees on his fields and also contributed to the maintenance of the community grazing land. He looked after the animals owned by him, sometimes with the assistance of a grazing hand and cultivated the fields owned by him, with or without hired labour or share croppers.

The trees provided fodder for the cattle. They also provided fuel for the villagers. The leaves that fell were put to uses beneficial to the agricultural fields. Meanwhile their soil and water conservation properties were beneficial for the villagers and contributed to maintaining the fertility of agricultural fields, as well as providing shade during the scorching summer. In addition, certain trees provided edible fruits, medicines, gum, toothpaste and a host of other commodities of every day use. In some villages trees were used for lac cultivation, and for raising silkworms and bees. Owing to their water conservation properties trees were also responsible in several villages for ensuring an adequate supply of drinking water.

Cattle provided milk and milk products and contributed to the nutritional content of the villagers' diet. Cattle dung provided organic fertilisers for the fields, while the poultry provided eggs and meat. The skins of dead cattle were used for making footwear and other leather products-all such activity being carried out in the village. Not least, bullocks ploughed the fields.

The fields produced foodgrains, pulses, oilseeds and vegetables for the villagers. The residues of those crops, of no direct use to man who could not eat them, were fed to the cattle. Poultry birds scavenged the wasted scattered grain.

Harmonious as the system was, disturbing a single component could have a chain effect of far-reaching consequences. For instance, if for some reason the villagers did not properly look after the community grazing lands and trees or if these were destroyed by some

outside force, say a timber merchant, then soil and water conservation would inevitably suffer. The fertility of the agricultural fields would not only be directly affected but also indirectly, because shortage of timber would mean that more dung would have to be used as fuel, thereby leaving less for fertilising the fields. The next consequence would be shortage of fodder, leading to a weakening of the animals. In addition, the villagers would be gradually deprived of several commodities of everday use, including fruits and medicines.

Over much of India, the traditional harmonious mixed farming system has been disrupted. Thus around most villages the land is eroded, agricultural yields are low, there is shortage of fuel and fodder, the bullocks are weak, and the milk yield is low.

Under such conditions it is vital that a massive tree planting programme in and around the village should be undertaken and the grazing lands be rehabilitated. Not only will such activities put agriculture and animal husbandry back on their feet, they will also help solve the problem of fuel shortage and help improve the drinking water situation.

Furthermore planners should study the numerous varieties of crops being grown in those areas, and should then make good quality seeds available to the villagers. Better field preparation and help with manuring, sowing operations, crop management and with post harvest storage will lead to better quality of crops as well as yields. All this can be done within the framework of the traditional system, that is, maintaining the essential harmony of agriculture, animal husbandry and forestry.

Any effort to rebuild or improve the traditional system of mixed farming must be done in a manner in which there is no conflict between agriculture, forestry, animal husbandry and the real needs of the village. It is all too easy to go against the essence of the traditional system - for instance, through planting tree species which while meeting the requirements of industry do not provide fodder to the villagers nor increase the fertility of the fields. furthermore, breeds of cattle can be promoted which cannot thrive on crop residues but must be fed on foodgrains that before were consumed only by human beings.

Thus some varieties of pine and eucalyptus, both of which are being promoted in the government's tree planting programmes, have leaves that cannot be consumed as fodder, while their acidic properties diminish the fertility of agricultural land as well as lowering its moisture content. Moreover with certain breeds of cow that have been introduced, it becomes necessary to use village land for growing green fodder as well as coarse cereals in order to feed the cattle, thereby diminishing the availability of food in the village, even though milk production is expected to rise. Within the traditional system, milk production does not rise at the expense of losing food grains since cattle are expected to consume only green tree leaves and crop residues. Moreover, the benefits of cross-bred cows and of higher milk production are likely to

accrue at least initially to the better off villagers, while the effect of decreased food production will probably be felt by the poorer sections of the community.

New agricultural technology in the form of tractors and fertilisers will again benefit the richer farmers, who will therefore be able to increase their agricultural production and cash receipts. On the other hand, their dependence on organic manure and bullocks is reduced, so that their requirement for fodder becomes less. All those factors may lead them to neglect the growth and proper maintenance of grazing lands. In fact, owing to the high value of any additional land, they may even be tempted to encroach grazing land and grow crops on it, using tractors and chemical fertilisers. In the process the rest of the village becomes worse off than before.

In recent years ambitious programmes of agriculture, dairy development and forestry have been undertaken and even more ambitious programmes will be undertaken in the near future. In view of the massive investments being made, the development planners should pause to think about the merits of the traditional system of the Indian village and the way in which the villagers made the best use of available resources with minimal wastage.

What Voelcker wrote nearly 100 years back may be valid today also: "I believe that it will be possible here and there to graft onto native practice the results of the western experience, but the main advance will come from an enquiry into native agriculture, and from the extension of the better indigenous methods to parts where they are not known or employed."

How we work - Go to the people
Live among the people
Learn from the people
Plan with the people
Work with the people
Start with what they know
Build on what the people have
Teach by showing
Learn by doing
Not a showcase but a pattern
Not odds and ends but a system
Not piecemeal but integrated approach
Not to conform but to transform
Not to relief but release

Chinese community organizer in the 1920s.