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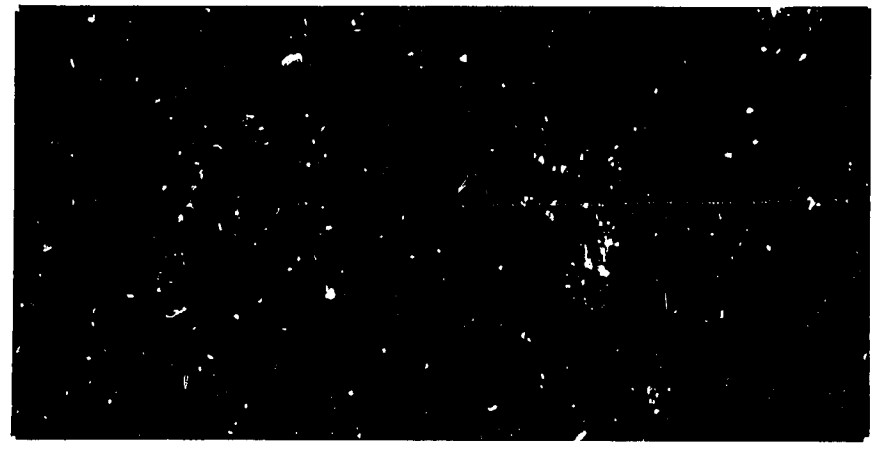
Farming Systems Research Group

MICHIGAN STATE UNIVERSITY



The Farming Systems Research Group at Michigan State University is drawn from the departments of Agricultural Economics, Agricultural Engineering, Animal Science, Crop and Soil Science, Food Science and Human Nutrition, Sociology, Veterinary Medicine, and supported by the International Agriculture Institute of M.S.U. and the U.S. Agency for International Development through a matching strengthening grant under the Title XII program.

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The Farming Systems Research Group at Michigan State University, supported by Title XII Strengthening Grant Funds from the U.S. Agency for International Development, and administered by the Institute of International Agriculture, has included Dr. Jay Artis, Department of Sociology; Dr. Robert J. Deans, Department of Animal Science; Dr. Merle Esmay (and Dr. Robert Wilkinson), Department of Agricultural Engineering; Dr. Eric Crawford, Department of Agricultural Economics; Dr. Russell Freed, Department of Crop and Soil Sciences (also representing Horticulture); Dr. Al Pearson, Department of Food Science and Human Nutrition; Dr. Tjaart Schillhorn van Veen, Department of Veterinary Medicine; with Dr. George Axinn, International Studies and Programs and Agricultural Economics, Chair, and Ms. Beverly Fleisher, graduate research assistant.

SOCIAL IMPACT, ECONOMIC CHANGE, AND DEVELOPMENT -- With Illustrations from Nepal

By George H. Axinn and Nancy W. Axinn

Working Paper No. 13

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THE MICHIGAN STATE UNIVERSITY FARMING SYSTEMS RESEARCH GROUP

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STAFF PAPER # 1981-46

Social Impact, Economic Change, and Development
-- with illustrations from Nepal

by

George H. Axinn and Nancy W. Axinn

This material was excerpted by Professor George Axinn from a monograph now being processed, and was presented at a conference on SOCIAL IMPACT ANALYSIS AND DEVELOPMENT at Michigan State University, 14-16 May 1981. The Monograph and the research upon which it is based reflect a collaborative research project, led by George and Nancy Axinn, which involved many Nepalese Colleagues at the Institute of Agriculture and Animal Science, Rampur, Nepal, and several graduate students at Michigan State University. Limited distribution in this form is for discussion and revision purposes only. Comments will be appreciated by the Axinns at MSU

Social Impact, Economic Change, and Development -- with some illustrations from Nepal[1].

by George H. Axinn, Professor of Agricultural Economics and Assistant Dean of International Studies and Programs, Michigan State University

There are four main ideas relating to the theme of this conference on social impact analysis and development which I would like to share with the group. These ideas are methodological rather than theoretical; they are micro rather than macro, in terms of level of analysis; and, at best, they merely provide some additional categories which may be useful to those concerned with social impact of development activities.

To illustrate these ideas, I shall present some material based on field observation and data collection in Nepal.

The four main ideas are: (1) impact analysis as evaluation; (2) description needs depth; (3) analysis via energy transformation; and (4) the recycling ratio in social impact analysis.

Impact Analysis as Evaluation

To measure the impact of any particular set of activities upon a group of human beings is an evaluative process. It calls for judgments to be made on the basis of the values of those who make the judgment. To do it well requires both descriptive and analytic tools.

In many ways, the depth and accuracy of the description is crucial if the evaluation is to be sound. Unfortunately, the scholarly community,

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[1]Paper presented at the Social Impact Analysis and Development Conference, Michigan State University, 14-16 May 1981

particularly in North America, has tended to devalue descriptive research in favor of studies of trends, comparative studies, and experimental research. Too often, from my perspective, phenomena which are being compared with each other over time, or in different locations, have been less than adequately described in the first instance, and the weakness of the descriptive work is reflected in everything else that follows.

The quality of description, particularly the description of human groups, may be directly related to the empathy of the observer. The sensitive scholar, who can empathize in a genuine way with those being observed, is sometimes able to develop a depth of description beyond that which is available when one merely measures the quantities of those things which seem to be relevant on the surface.

Patterns of behavior at various seasons of the year, and at different times of day can be extremely important. Thus, the quality of description may be directly related to the time invested in that description. Excellent description of what happens at a particular hour of the day in a family or a community might be quite misleading if it is assumed that the same types of activity continue at other hours of the day. Similarly, typical behavior patterns during the monsoon season in a rural village might be quite different in the dry season in that same village.

Further, the values, norms, and aspirations of the individuals being described are typically quite different from the values, norms, and aspirations of those who are making the description. Here is where empathy is so important. Here is where time invested may be directly related to quality

For example, well meaning professional agriculturalists in Nepal have been selecting new maize varieties on the basis of the quantity of grain produced by each plant. The value placed on the grain can be related directly

to the training of those professional agriculturalists, and to the network of significant others with whom those agriculturalists interact, in their own ministry of agriculture, in the international agricultural research community, and in the schools in which they did advanced postgraduate study. All tend to be concerned with the grain production of maize plants. Farmers in Nepal, on the other hand, who feed large numbers of ruminant livestock every day, are also concerned about the green parts of the maize plant.

There has been a tendency for those maize plants which have largest quantities of grain on them to be relatively short stemmed plants which produce less green material. But the green parts of the plant produce the fodder for cattle and buffalo, sheep and goats. It is not surprising that a group of professional agriculturalists, not unlike a group of professional social scientists or anyone else, who have different values, norms, and aspirations might not have inherently appreciated the value of the green parts of the maize plant to small mixed farming families in a place like Nepal. What is disappointing is that the level of description of the situation which might have been done prior to the identification of the problems associated with the production of maize in that country, was not adequate to reveal this phenomena.[2]

Description Needs Depth

Of course, what is described will be based on the conceptualizations, the theory, and the hypotheses which are of concern to those making the description. It is impossible, and certainly not parsimonious, to describe everything about a small farm family. But if one has social impact analysis

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[2]Detailed descriptions of rural life in Nepal, and analysis based on concepts discussed in this paper may be found in the monograph, "Continuity and Change in the Rural Social Systems of Nepal," George H. Axinn and Nancy W. Axinn, forthcoming.

in mind, and some empathy with those who are being described, and some empathy with those who will attempt to understand the analytic material, then the description can be informed by both sides.

Consider, for example, Table 1, which tries to relate the size of farm family ecosystems with human pressure on the land in a small remote rural village in the central part of Nepal. Sundar Bazaar is in Lamjung District. It is relatively remote, in that there are no motorable roads which lead to Sundar Bazaar. In fact, at the time of these studies in 1977, this village could not be reached by motorcycle or bicycle. Pony trains regularly go through Sundar Bazaar carrying some freight; everything else is carried in or out by human beings. If you want to go there, you must walk. Walking time from the nearest motorable road is more than 8 hours for me; perhaps less for some others. It is at least 5 hours to the nearest grass airstrip, if one is wealthy enough to fly.

Table 1 illustrates that most of the rural people who live in the Sundar Bazaar area have very small size farms by international standards. If you notice the grouping, four farms have been sifted out from the rest because their farms are so large. They control, on the average, just over four hectares of land. The others are all smaller than that. The average size of farm for the 66 other families in this study is just over 1/2 hectare.

The original reason for constructing this table was to describe the dense human population on the land, and to illustrate areas by the size of farm. Thus average figures for Lamjung District, or even for Sundar Bazaar area as a whole, tend to be quite misleading. For example, in Sundar Bazaar area, at the time of this study, there were 7.5 persons per hectare. However, on the smallest group of farms in this study, there were 24 persons per hectare whereas in those four out-sized "large" farms, there were only about two persons per hectare.

Table 1 -- Farm Size and Human Pressure on the Land in Sundar Bazaar Area of Lamjung District, Nepal, 1977

	Number of Families	Average Size Farm (Ha.)	Range of Farm Size (Ha.)	Ave. No. of Persons per Farm	Persons per Hectare
Group I	16	0.17	.025-.25	4.1	24.0
Group II	17	0.39	.25-.51	5.6	14.7
Group III	16	0.62	.53-.71	6.1	9.9
Grcup IV	17	1.20	.76-1.82	7.7	6.4
Group V	4	4.06	2.54-6.01	7.8	1.9
Total or Average	70	0.93	025-6.01	6.0	7.5
Groups I - IV	66	0.60	025-1.82	5.9	9.9

My students at Michigan State University have difficulty conceptualizing a hectare. I, too, have difficulty thinking about a hectare. In an effort to illustrate this description, Table 2 was made from the same data. I am much more used to seeing tennis courts than I am to seeing hectares. However, with some simple arithmetic, I discovered that you can get 38.44 tennis courts on one hectare of land. Also, you can get almost two football fields on one hectare of land. With that kind of information, one can describe the human pressure on the land by showing that on the smallest farms, each individual person has about 1 1/2 tennis courts on which to produce his/her living. On the biggest farms, each person has about 20 tennis courts on which to produce food, clothing, and shelter.

In terms of crowding and population density, if you picture a typical U.S. football field including the end zones, people who have the largest farms in Sundar Bazaar have the equivalent of one of those football fields per person. On the smallest farms, there is more than one person in the space between each of the 10 yard stripes -- more than 13 people on one football field.

When first confronted with this descriptive data, I was concerned that the lack of equity in land holdings might be overstated. Observation had taught that some of the land higher up on the hills was usable only for pasture of animals, and the best land was down in the narrower valleys, closer to the rivers, and could be irrigated. One hypothesis was that the larger farms had more poor land. Therefore, another analysis was made, and reported here in Table 3, showing the percentage of irrigated land per farm by size of farm. Contrary to the expectation mentioned above, it was evident that the larger the size of farm, the larger the proportion of high quality irrigated land on the farm. In other words, those with the most wealth, had both the highest quantity and the highest quality of land.

Table 2

FARM SIZE AND HUMAN PRESSURE ON THE LAND
IN SUNDAR BAZAAR AREA OF LAMJUNG DISTRICT
NEPAL, 1977

GROUP	NUMBER OF FAMILIES	AVERAGE SIZE OF FARM			TENNIS COURTS PER PERSON	NUMBER OF PERSONS PER FOOTBALL FIELD
		HECTARES	TENNIS COURTS	FOOTBALL FIELDS		
I	16	0.17	6.5	0.32	1.6	13.2
II	17	0.39	13.8	0.73	2.5	7.7
III	16	0.62	23.8	1.16	3.9	5.3
IV	17	1.20	46.0	2.24	6.0	3.4
V	4	4.06	155.7	7.59	20.0	1.0

One Tennis Court = 260.75 square meters

One Football Field = 5,351.53 square meters

One Hectare = 10,000 square meters

Table 3 -- Proportion of Irrigated Land (Khet) on Farms in Sundar Bazaar, Lamjung District, by Size of Farm, Nepal, 1977

Number	Average Size of Farm (Hectares)	Percentage of Total Land Irrigated (Khet)
16	0.17	36.5*
17	0.39	63.1
16	0.62	66.9
17	1.20	75.3
4	4.06	76.5

* Includes six farms with zero percentage of irrigated land.

Intensity of cultivation is another aspect of life on one of these small farms which can be described. As Table 4 illustrates, those with the smallest land holdings also tend to till the soil most intensively. The three smallest groups of farms seem to be using around 180 percent of the land. This means that many of their fields are cultivated twice each year, and some may even be cultivated thrice. By contrast, on the very largest farms, even though theirs is the best quality land, they seem to be using only just over half (57.9) percent of the land available to them. Table 4 also shows the different cereal grain crops produced on those farms. From that, a reader may note that the percentage of available land used for production of maize is highest on the smallest farms and least on the biggest farms. Conversely, rice production is more significant than any other cereal grain on all sizes of farms.

And just as Table 4 attempts to illustrate the intensity of production of cereal grains, Table 5 shows that the numbers of animals are large on all of these farms. This is an effort to describe the relationship between the size of farm and the numbers of farm animals on that farm. As with the human population, total livestock populations per hectare are greatest on the smallest farms, and significantly less on the larger farms.

Description could go much further. The point here is that some depth of description provides insight into the nature of life among those being described, which, in turn, can provide a base for social impact analysis.

Analysis via Energy Transformation

Beyond description, of course, analysis of what is going on in a particular situation, and how it changes over time, is crucial in social impact analysis. If there is no change over time, one could assume there has been no impact. If things do change then the issues arise as to whether the new situation is "better than" or "worse than" the prior situation. Then come the normative and evaluative judgments of what is more desirable and what is less desirable.

Table 4 -- Average Cultivated Crop Land by Size of Farm in Sundar Bazaar, Lamjung District, Nepal, 1977 as a Percentage of Total Land on that Farm

Number	Size of Farm (Ha.)	Paddy	Wheat	Mustard	Maize	Millet	Total Crops
16	0.17	45.3	15.3	7.1	75.3	28.8	171.8
17	0.39	65.6	21.5	6.2	53.8	35.1	182.2
16	0.62	74.2	30.2	6.5	47.6	20.6	179.1
17	1.20	62.4	14.8	5.7	24.1	10.0	117.0
4	4.06	32.6	9.1	1.6	6.9	7.7	57.9

Table 5 -- Distribution of Livestock on Farms in Sundar Bazaar, Lamjung District, Nepal, 1977

Number of Families	Average Size of Farm (Ha.)	Number of Large Animals per Farm 1/	Number of Small Animals per Farm 2/	Number of Large Animals per Ha.	Number of Small Animals per Ha.
16	0.17	1.69	2.38	9.98	14.05
17	0.39	2.94	3.76	7.65	9.79
16	0.62	4.88	3.94	7.90	6.38
17	1.20	5.41	4.06	4.49	3.37
4	4.06	4.50	6.25	1.11	1.54
Total or Averages					
70	0.93	3.79	3.70	4.75	4.64

1/ Includes bullocks, adult cows, adult buffalo.
2/ Includes goats, sheep, young cattle and buffalo.

However, prior to that, and assuming that continuity and change are normal phenomena for any human group, the issue arises as to what should be measured. Too often, the highly differentiated, specialized, money economies of North America and Western Europe guide scholars to make their measurements in terms of cash flow. In the example below, I should like to suggest that materials flow and energy transformation can also be used as markers of continuity and change. Energy flow can be used as a proxy for various other kinds of change, just as cash flow is used (usually by economists) as a proxy for other kinds of change. Since our concepts of poverty tend to be as culture bound as other indicators of what some have termed the "quality of life," the rationale for the search for other markers is associated with an attempt to "escape" the cultural norms associated with so many other markers of change.

In Nepal, my colleague and research partner (and wife), Nancy Axinn and I attempted to make estimates of materials flow and energy transformation in farm family ecosystems.

The farm family has been selected as the unit for analysis, building on the concepts of functional differentiaton in rural social systems, with the family ecosystem as the basic unit, and considering shifts in both social differentiation and energy transformation as central variables in a cycle of continuity and change. (Axinn, 1977, Axinn and Axinn, 1979, 1980).

The majority of people in Asia, Africa, and Latin America live on small pieces of land, and subsist by consuming what they produce and producing whatever they consume. Further, current census data from Asia indicate that the total numbers and relative proportion of such families is increasing.

Different from the large-scale, commercial, capital-intensive farming systems of North America and Europe which are specialized in the production function, these farming systems are small-scale, non-commercial, land and

labor intensive units which perform supply and marketing functions as well as production, and are also heavily involved in personal maintenance, health care delivery, governance, and learning.

Since they are less differentiated, these farming systems also tend to produce a great variety of cereal grain, livestock, and fruits and vegetables. From an agricultural economic perspective, they are integrated both vertically and horizontally. Even their production is much less specialized than that of the large-scale farming systems.

Whereas cash flow may provide an adequate indicator of the total flow of materials through the large-scale commercial farming system, it is less useful as a proxy for such activity in the small, mixed farming systems. In a unit which sells its outputs for cash money, and purchases its inputs with the same currency, the flow of cash tends to correlate with the total volume of other activity, and with relative wealth, and may serve as descriptive proxy for the entire system. In the subsistence unit which tends to recycle more materials than it exchanges with other systems, the flow of cash sometimes accounts for such a small proportion of the materials flow that it is misleading.

For example, a small mixed subsistence farming system will be declared in "relative" or "absolute poverty" by international agencies if its annual cash income is below a certain mark. However, the same system may have a large kitchen garden, may provide its human members with more than adequate quantities of fresh milk and dairy products, some meat, and eggs, and actually be so wealthy that the family which owns and operates it does little physical work. They may have servants and farm hands to do the physical work. (This is a relative phenomenon, since in such systems wage rates tend to be quite low).

Since the "shadow production" which is consumed within tends not to be reflected in cash flow measures, the higher the proportion of materials flow which internal, the less adequate a proxy such as cash income is as an indicator of the nature of the system.

Energy transformation is an alternative proxy which can be a useful indicator of change over time, both for the large-scale commercial farming systems and for the small-scale subsistence farming system, as well as transitional units in various stages in between.

Just as a monetary value can be assigned to any sort of item, so can an energy value. And the two types of evaluations can be exchanged. Thus, there is no special "magic" about energy values that makes them better than money values. However, as descriptors of materials flow and other activity in a farming system, the use of energy values as a proxy offers some advantages.

One advantage of an energy measure, like KCals, BTUs, or Joules, in comparison with such money measures as rupees, pounds, pesos, or dollars, is that the relative values are defined and generally accepted as unchanging. The ratio of U.S. dollars to Indian rupees changes from day to day, but one KCal equals 3.968 BTUs by international convention, and the ratio tends not to change.

A second advantage is that while the cash price of one kilogram of rice, for example, varies from one place to another on any given day, and the world price of rice varies from day to day and year to year, the number of KCals in one Kilogram is relatively standard. Even with variation in the type of rice, its moisture content, and the way in which energy value is to be transformed (burned, eaten by humans, eaten by ruminants), the energy values are relatively more standardized than the money values.

And thirdly, in systems which utilize cash for a relatively low proportion of all transactions, the assignment of cash values may be even less valid than assignment of energy values. However, in both cases, such proxies

assigned to a variety of materials should be considered as only approximations of a relative value, and not precise measures of reality. Thus the large calorie (KCal) is used here an an indicator of estimated relationships, and nothing more.

Just as social phenomea described by money values are subject to certain economic "laws," the energy descriptor is conditioned by "the Laws of Thermodynamics." (Georgescu-Roegen, 1975). Thus the engineering concepts related to energy flow can be as helpful to the social analysis as the economic concepts, and combining both may strengthen the analysis.

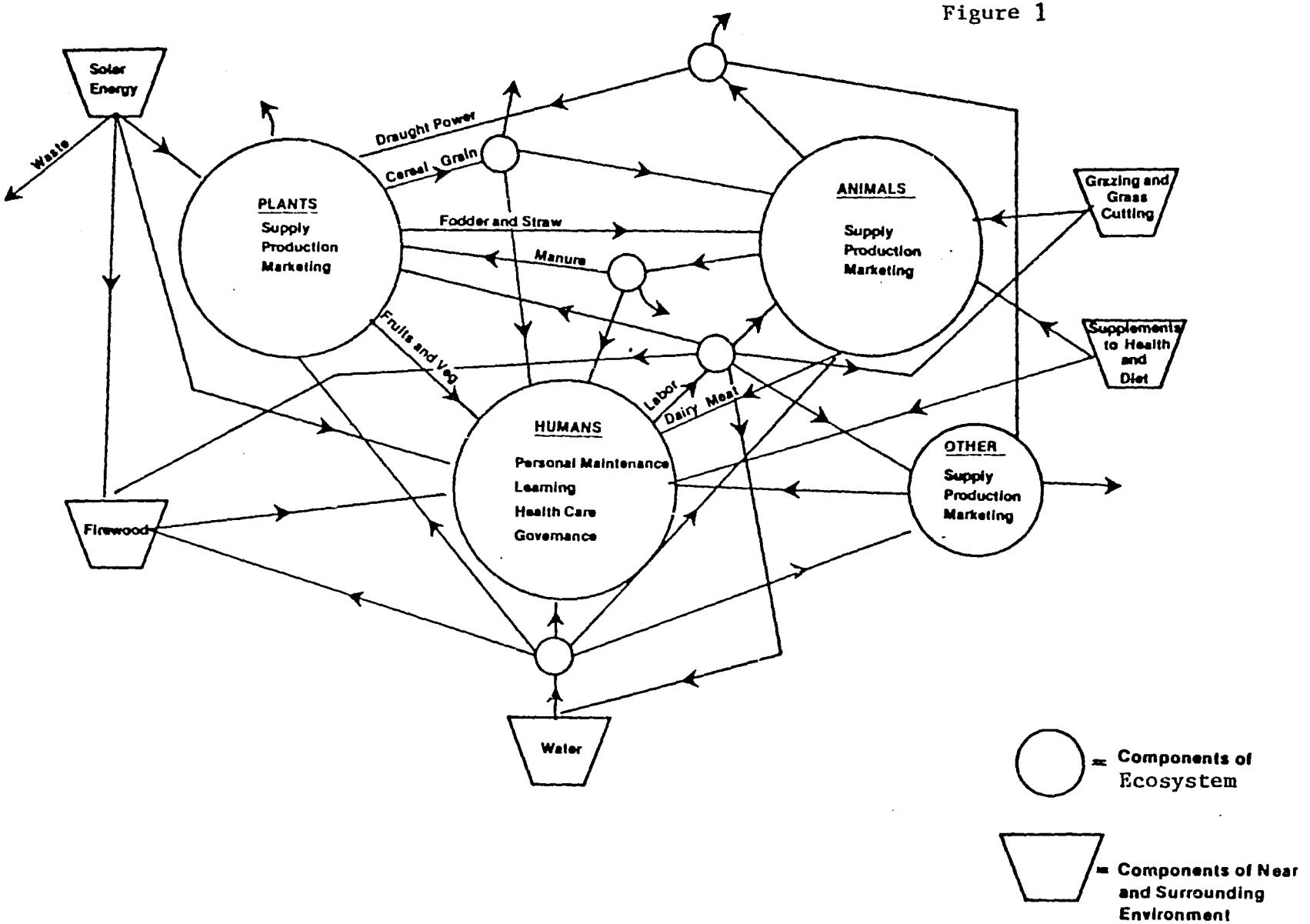
As will be demonstrated below with data describing small farm family ecosystems in Nepal, it is possible and feasible to estimate the flow of materials and transformation of energy in such systems. Out of rudimentary efforts to do that has emerged a conceptualization of the farming system which, in turn, provides a base for sociological analysis of continuity and change, and for demonstrating a relationship between social differentiation and energy transformation.

The conceptual framework for the materials and energy transformation perspective of small farm family ecosystems is illustrated in Figure 1. Here, a farm family ecosystem is viewed as a component of a larger rural social system. The larger system has many similar farm family ecosystems, and all are seen as part of a still larger social, political, economic, religious, cultural, and physical surrounding environment.

Within farm family ecosystems, the three major components are plants, animals, and humans. This conceptual framework is similar to Koenig and Tummala (1972), and the model developed by Tummala and Connor (1973), which provide a technique for accounting for the mass and energy flows into and out of similar agricultural systems. It is also similar to the work of Thomas (1974 and 1976). While the analytical techniques are similar, this model differs in that it allows analysis of a basic <u>subsistence</u> ecosystem, in which most materials and energy are recycled within the system, rather than exchanged with the outside world.

Energy Flow in Small Subsistence Farm Family Ecosystems

Figure 1



SOCIAL POLITICAL ECONOMIC RELIGIOUS CULTURAL PHYSICAL = COMPONENTS OF SURROUNDING AND FAR ENVIRONMENT

Thus, the major flows of materials and transformations of energy in this model are among the plant, the animal, and the human components. The "other production" component deals with such "subsistence industry" activities as the manufacture of tools, clothing, housing. Major outside flows to the farm family ecosystem from the surrounding environment are solar energy, water, firewood, grazing and grass cutting, and small supplements to health and diet (such as salt and spices). There is significant exchange of both human labor and animal draft power among the farm family ecosystems in such a rural social system.

Major inputs to the human component of such a system are cereal grains, fruits and vegetables, milk and dairy products, meat, firewood, and water. Principal energy outputs are in the form of labor. Learning and controlling (deciding and allocating) reflects small energy transformations, serving as "triggering" mechanisms as described by Adams (1974).

The animal component of the farm family ecosystem may include such livestock as cattle, buffaloes, goats, swine, and poultry. Major outputs from the animal component include draft power, manure, milk and dairy products, meat, and eggs. Inputs to the animal component are straw and fodder, cereal grain or grain by-products, human labor, tools and facilities (including stables and barns), and grazing.

The plant component is the major energy source for the small subsistence farm family ecosystem. It can be likened to the system's powerhouse as it converts solar energy into nutrients which can be transformed by both the humans and the animals, and which supply the bulk of their calorie requirements.

In addition to solar energy, other inputs to this component include draft power, manure, (or other fertilizer), human labor, tools, seed, and water, along with such other potential inputs as insecticides, fungicides,

and herbicides. However, the magnitude of solar energy available on each hectare of land is so much larger than all other energy sources combined that the entire system can be viewed as one which takes a small fraction (estimated at one to three percent) of the available solar energy and converts this as the resource for all other activities.

By combining the flow of materials into and out of each of the major components of such a system, it has been possible to illustrate differences between farm family ecosystems on different size pieces of land, and to demonstrate the relationship among farms of various sizes in a rural social system.

Beyond that, such a model offers a useful conceptualization to those who study the whole farming system. It enables evaluation of the costs and benefits of production, for example, of any particular plant or animal commodity in relationship to all inputs and outputs as they flow through such a system.

For example, one variety of cereal grain can be compared to another one not only on the basis of grain production, but also in terms of the use of straw and other by-products, as well as costs in terms of seed, human labor, manure, and draft power.

Further, in addressing such questions as the potential substitution of small scale garden tractors for animal draft power, such a conceptualization permits the inclusion of several variables which may be overlooked by conventional studies of this issue . (Axinn and Axinn, 1979, 1980).

Relationship of Materials and Energy Flow to Social Differentiation

With estimates of materials flow and energy transformation in farm family ecosystems, it is feasible to use these as indicators of functional differentiation. The supply, production, and marketing functions, in

particular, can be compared among different farming systems. Farming systems which specialize in production will tend to have greater proportions of materials and energy flows from outside (input supply), and greater proportions of such flows to the outside (output marketing). Less differentiated farming systems tend to have a higher proportion of total flows within the farm family ecosystem.

From this perspective, social differentiation may be used as an indicator of change. Most strategies for rural development have been strategies designed to increase functional differentiation in farming systems. One reason that international attempts in rural development have not been more successful, has been that designers of such projects have tended to use such economic indicators as cash flow rather than assessments of such social phenomena as functional differentiation.

Structural and functional analysis of rural social systems can provide a base for assessing change, and for development strategy. Such phenomena as status, role, boundary maintenance, migration patterns, and value orientations may be much more significant to change in rural social systems than annual cash income.

Similarly, farming systems which are less differentiated in function tend to carry on more different types of operations. A family which supplies its own inputs and consumes its own outputs will not specialize in one crop. Rather, it will tend to produce cereal crops, livestock, fruits, and vegetables. Conversely, in the highly differentiated large-scale dairy farm of mid-America, for example, although it may produce milk from 300 cows daily, 100 percent of that milk is likely to be sold to a separate firm. If the farm household requires a quart of milk, they are likely to purchase it from an outside supplier.

Figure 2 provides a diagramatic illustration of what might be termed a "pure" type of commercial farming system. Materials and energy flow in as inputs (arrow A) and flow out as outputs (arrow B). If 100 percent of the materials and energy flow were describable by indications of the total flows on arrows A plus B, that would be, by definition, a "pure" type farming system where the production function dominated all other functions.

If a "pure" type of subsistence farming system were to be described with a similar diagram, it would look like Figure 3. There, arrow C represents the materials and energy flow which is both produced by the farm family ecosystem and consumed by that same farm family ecosystem. If zero inputs were supplied from outside systems, and zero outputs were marketed to outside systems, then 100 percent of the materials and energy flow would be on arrow C, and that would be a "pure" type of subsistence farming system.

Neither of these "pure" types exist among the rural social systems of the world. Even the most remote and undifferentiated farm family ecosystems tend to exchange some materials and energy with outside systems, and even the most commercially specialized farm family ecosystems tend to transform some of the materials and energy which flow into them within the system, producing some kinds of outputs which are consumed within the system.

The analysis of social differentiation in rural social systems indicates that the quantities of energy transformed also vary over time. The evidence presented below suggests the proposition that functional differentiation and energy transformation vary together. The more highly differentiated the farming system, the greater the quantity of energy it will tend to transform.

Further, the more differentiated the farming system, the larger the farm itself is likely to be. The larger the farm, the greater the total flow of materials and energy per person is likely to be. This wealth tends to be accompanied by social and political power.

Figure 2

DIAGRAMATIC ILLUSTRATION OF "PURE TYPE"

COMMERCIAL FARMING SYSTEM

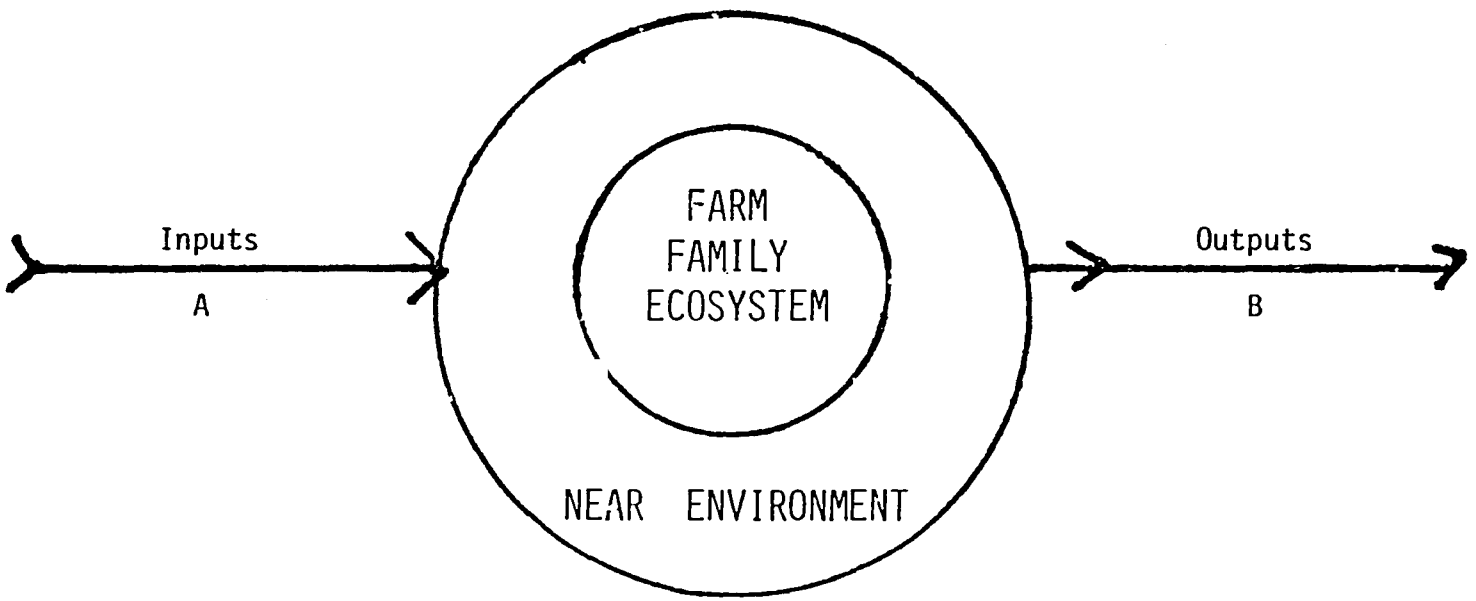
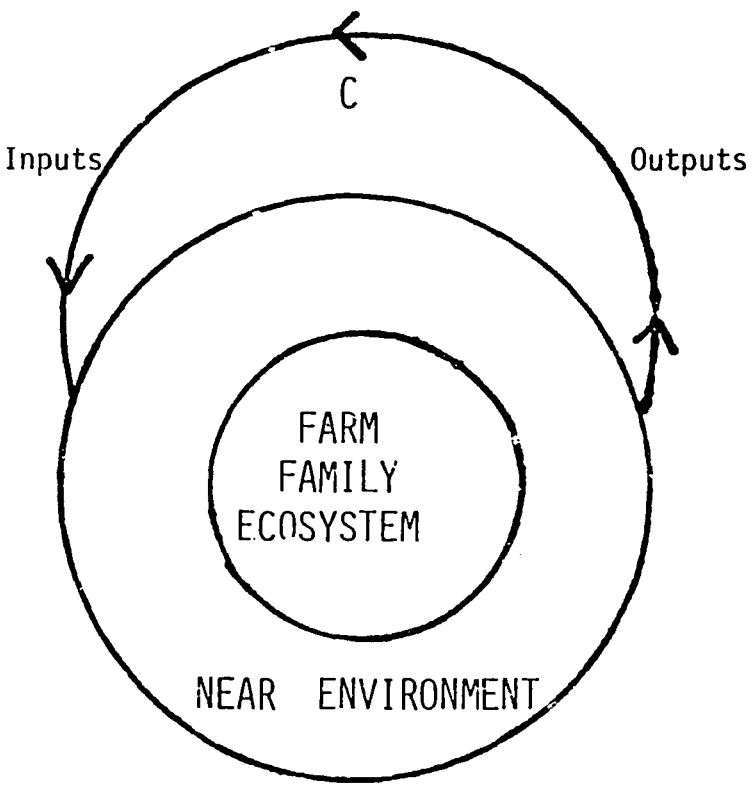


Figure 3

DIAGRAMATIC ILLUSTRATION OF "PURE TYPE"

SUBSISTENCE FARMING SYSTEM



The Recycling Ratio

The extent of functional differentiation in a farming system is indicated in this study by a recycling ratio. The higher the proportion of materials and energy flow which is within the farm family ecosystem and its near environment, the higher the recycling ratio. The higher the recycling ratio, the less the farm family exchanges materials and energy with outside systems. Farms with a high recycling ratio are usually called subsistence farms. Farms with a low recycling ratio are referred to as commercial or market-oriented farms.

The diagram in Figure 4 was constructed by putting together the diagram in Figures 2 and 3, to illustrate a typical farm family ecosystem. Materials and energy flow in (arrow A), materials and energy flow out (arrow B), and the system also recycles some of its materials and energy (arrow C). The recycling ratio represents the proportion of the total flow which is recycled (internal). It is calculated by adding an estimate of the total flow in from other systems (A) to an estimate of the total flow out to other systems (B) and to an estimate of the total quantity of flow which is recycled within the system (C); and then dividing that sum into the total quantity of flow which is recycled within the system. The formula may be represented as:

$C \div A + B + C$.

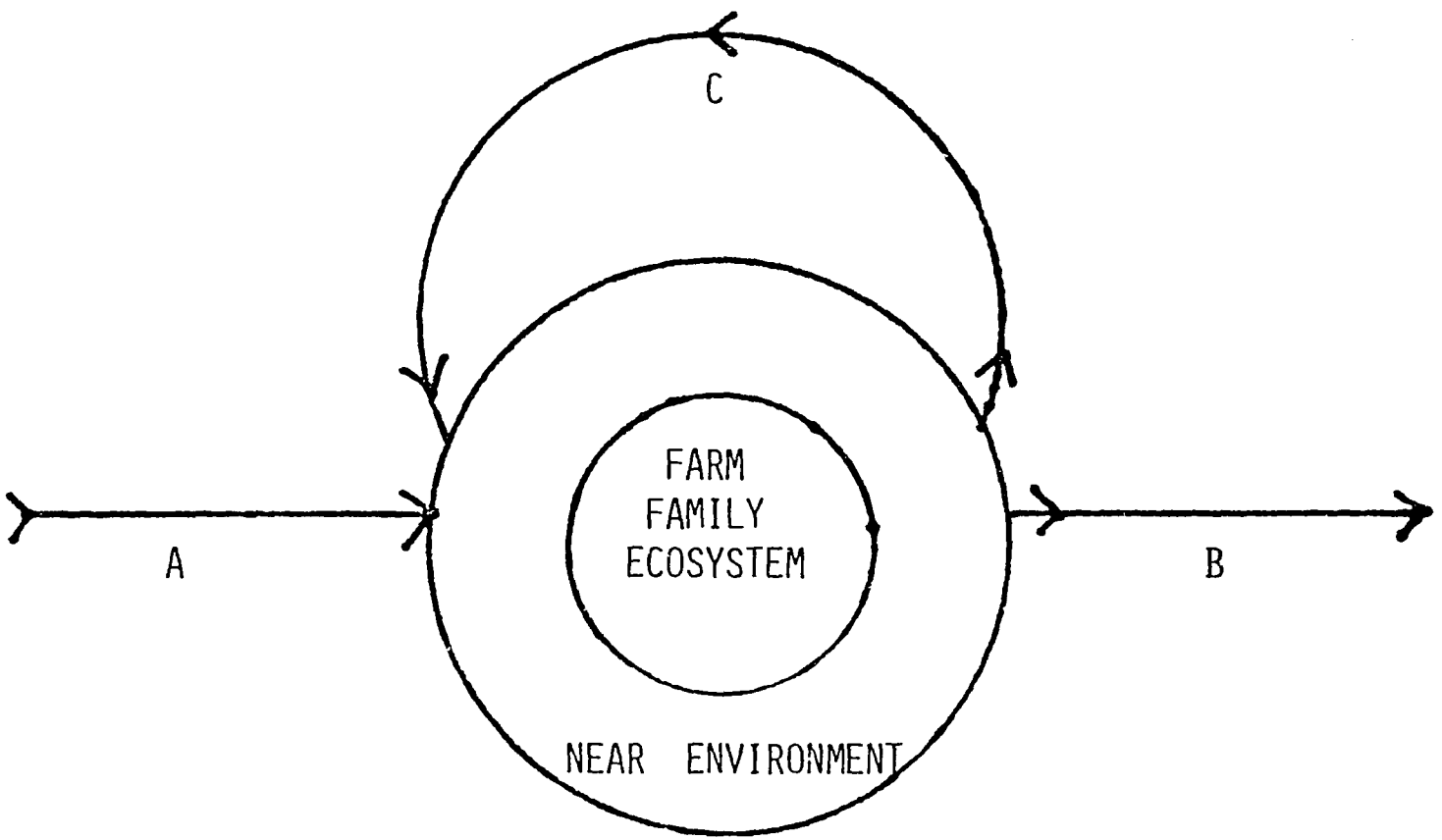
In terms of social differentiation, the recycling ratio deals directly with three functions: production, supply, and marketing. Farm family ecosystems with a high recycling ratio tend to distribute resources among these three functions more evenly than farm family ecosystems with a low recycling ratio, which tend to specialize in the production function, and depend upon others for the supply and marketing functions.

Figure 4

MATERIALS FLOW AND ENERGY TRANSFORMATION

IN A FARMING SYSTEM

(SIMPLIFIED DIAGRAM)



$$\text{RECYCLING RATIO} = \frac{C}{A + B + C}$$

From the perspective of dependence and independence, farming systems which recycle larger proportions of materials and energy within the system, are, by definition, more independent of other outside systems. Conversely, farming systems which recycle a smaller porportion, and receive greater quantities of materials and energy from outside, while marketing greater proportions of their production to others outside, are more dependent upon those outside the family system.

In the large scale, mono-crop, capital intensive commercial market oriented farming systems of North America, the recycling ratio tends to be very low. Most inputs are purchased from outside the farm family ecosystem (seeds, feed, fertilizer, and fuel for traction). Most outputs are sold in the market in exchange for cash.

By contrast, in the small scale, mixed-crop plus livestock, labor intensive, subsistence-oriented farming systems of Africa, Asia, and Latin America, the recycling ratio tends to be much higher. Most inputs are produced within the farming system. Most outputs are consumed within the farming system.

The recycling ratio can be useful as an indicator of rural development, but the normative issues of good and bad will depend upon what the society values in terms of its lifestyle. Thus, the community where each farm family has a high recycling ratio may not be benefited at all by the introduction of technologies which would reduce this ratio. On the other hand, if that community wants more of the goods available from the outside, then its goals may be a reduction of the recycling ratio -- and technologies which will lead to that reduction may, in fact, be appropriate. Thus, the recycling ratio can become an <u>indicator of change</u> in rural social systems, but not the <u>goal for rural development</u>, which is normative. The assumption is that

each family and each society may determine its own goals. The recycling ratio can be used as a measure of where they are, and as an indicator of progress in the directions they have chosen.

Development goals, can be stated in terms of the optimal levels of quantity of materials (converted to energy values). Similarly, the recycling of human labor, plant production, animal production, or other production can be separated from each other. Thus, a recycling ratio of human labor will demonstrate differences between families which must not only cater to their own needs, but also work as laborers (or servants) for others in order to sustain themselves. It demonstrates that other families have sufficient power to be served by outside laborers in terms of their normal lifestyle. This type of indicator allows a human group to fix developmental goals for themselves which are less likely to be skewed by "outsider's criteria" and the typical economic indicators of "cash income."

By observing activities on farm family ecosystems, it is possible to estimate the recycling ratio. This, in turn, permits comparison between individual families, and between rural groups of different cultures, different types of agriculture, and different religions. It also enables the separation of "subsistence" agriculture -- where the recycling ratio is very high -- from market agriculture -- where the recycling ratio tends to be much lower. Both from the perspective of insiders, who might systematically organize for their own "development," and from the perspective of outsiders, determined to assist with "development," different strategies are likely to be appropriate for farming systems with high recycling ratios than for farming systems with low recycling ratios. Thus, programs of technology development, of extension education, of market infrastructure would be quite different for the farming system with a high recycling ratio than for the farming system with a low recycling ratio.

To illustrate, supply of chemical fertilizer has been attempted in areas where farms have a high recycling ratio. Since farmers in those areas tend not to buy and sell on the market, they tend not to perceive need for such expensive outside inputs. Thus, chemical fertilizer programs have tended to fail in those types of situations. Conversely, farms with a low recycling ratio, and a high potential market output, may have needs for outside inputs to prevent depletion of soil fertility.

In evolving strategies for rural development, identification of "target groups" by the relative size of their recycling ratios might provide a useful focus for programming.

The recycling ratio for any group of farms indicates which farming systems are more "open" than others. Those with a high recycling ratio would be characterized as relatively more "closed." As they recycle most of their energies within the farm family environment, information supplied by tradition tends to be adequate to maintain the system. These farmers tend not to look to society's bureaucratic system to provide inputs of information via extension services, for instance, or material/energy such as seeds and fertilizer. Those with a lower recycling ratio would indicate more "openness" for new information which might be provided by outside systems. It could be assumed that those whose low recycling ratio reflect labor energy surplus would be responsive to information about alternative employment opportunities, training for different occupations, or intensive agriculture options. Those farmers whose low recycling ratio reflects surplus production available to the market would be open to information on credit and marketing, as well as alternative energy sources, such as mechanization, and fertilizer, which would reduce their dependency on farmers in labor surplus situations.

Additionally, this group of farmers would tend to be more specialized and hence look to the bureaucracy of the society to provide organizational management to expedite exchanges among specialized commodity producers.

Utlimately, those with the higher recyling ratios make the least demands for support services or material/energy inputs and are the least likely to be motivated to use those which are offered.

The recycling ratio, taken alone, may be considered to be value neutral. In the particular farming systems studied in Nepal, relationships between this ratio and other factors, not necessarily value neutral, are demonstrated. The extent of functional differentiation, the quantities of energy transformed, and the degree of independence tend to relate to various other social, economic and cultural indicators sometimes used to assess the 'quality of life.' From these conceptions of function and differentiation come hypotheses relating social differentiation to energy conversion quantities and to dependence.

Because of the social dimensions of this approach to rural development, it provides an alternative set of variables for assessing the social and cultural impact of change, and it opens new strategies for the social organization and administration of development.

The major hypothesis which flows from this rationale is that <u>there is a positive correlation between energy transformation and functional differentiation</u> in farm family ecosystems.

In addition, each of these characteristics of farm family ecosystems is <u>related to size. There is a positive correlation between size of farm and quantity of energy transformed</u>. Also, <u>there is a positive correlation between size of farm and functional differentiation</u>.

The recycling ratio has been suggested as an analytical tool, and, by definition, the extent of social differentiation in individual farm family ecosystems varies inversely with the size of the recycling ratio.

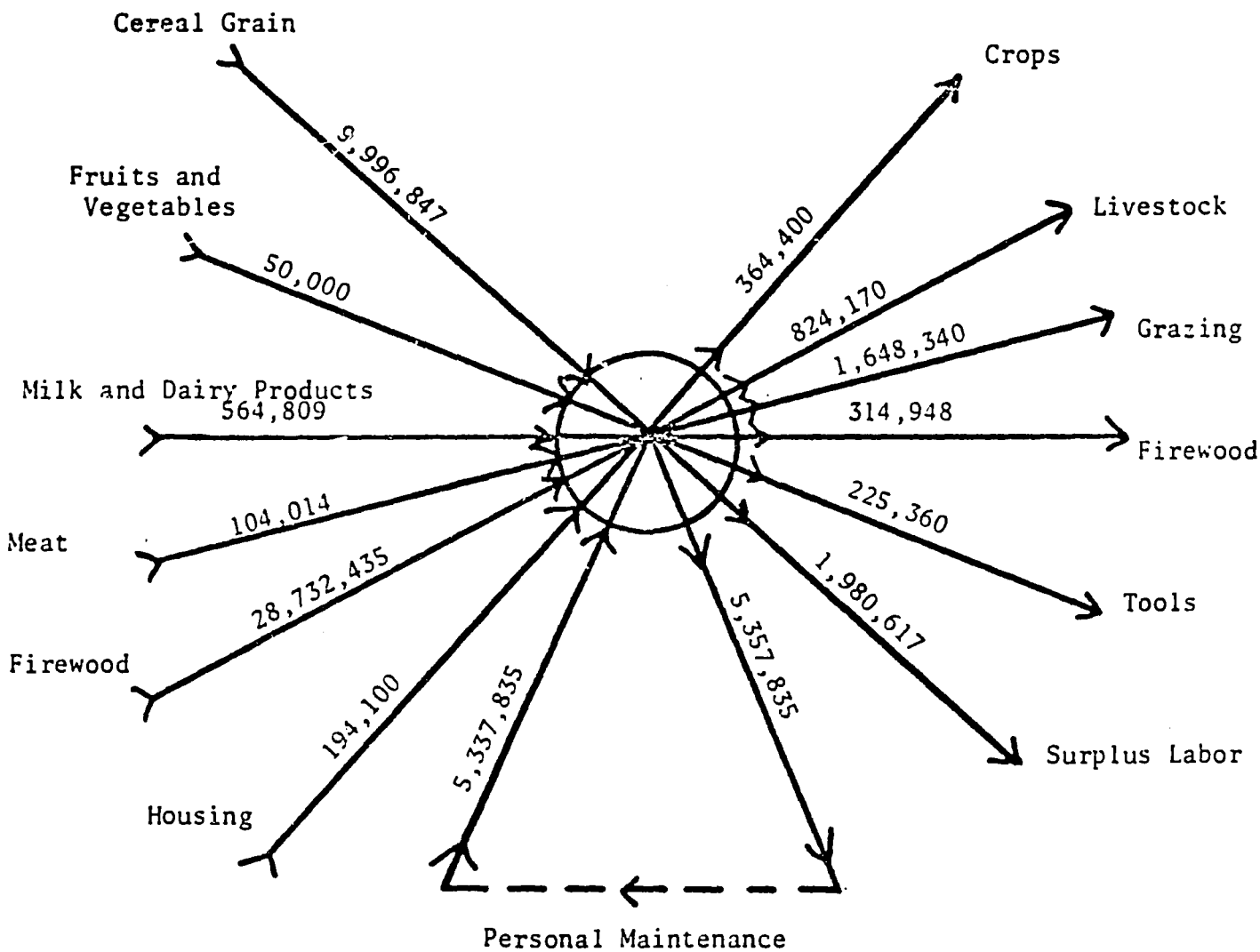
In order to test these propositions, actual quanities of flow, in terms of large calories, were calculated for the three main components illustrated in Figure 1 above. Figure 5 illustrates how one component, the human component, was analyzed on farms which average 0.39 hectares in the Sundar Bazaar of Lamjung District in Nepal. The quantities shown represent the quantities of energy flowing into and out of the human group on that size of farm during the course of one year. The figures are in large calories.

Having assembled such data, for each of the main components, it was possible to put the human component together with the plant component and the animal component of farms of a given size, as illustrated in Figure 6.

On the basis of this type of analysis, it was possible to construct Table 6, which is a gross approximation of the total materials and energy flow in farm family ecosystems and their near environment by size of land holdings in the same area. There, the total material and energy flow per farm family figures illustrate wealth in relationship to average size of landholding. Those who control the most land, also have the most energy flow per farm family.

The proportion of the total production of materials and energy in such a farm family ecosystem which is transformed within that family referred to above as the recycling ratio, is shown in Table 7 for Lamjung District. It is estimated by adding together the total production of calories by human, plant, and animal components of such an ecosystem and then calculating the proportions of these which are in fact recycled within the

Figure 5 Materials and Energy Flow in the Human Component of Farm Family Ecosystems in Sundar Bazaar Area of Lamjung District, Nepal, 1977. Average Farm Size 0.39 Hectares. (Energy transformations are presented in KCals per Ha. per Year)



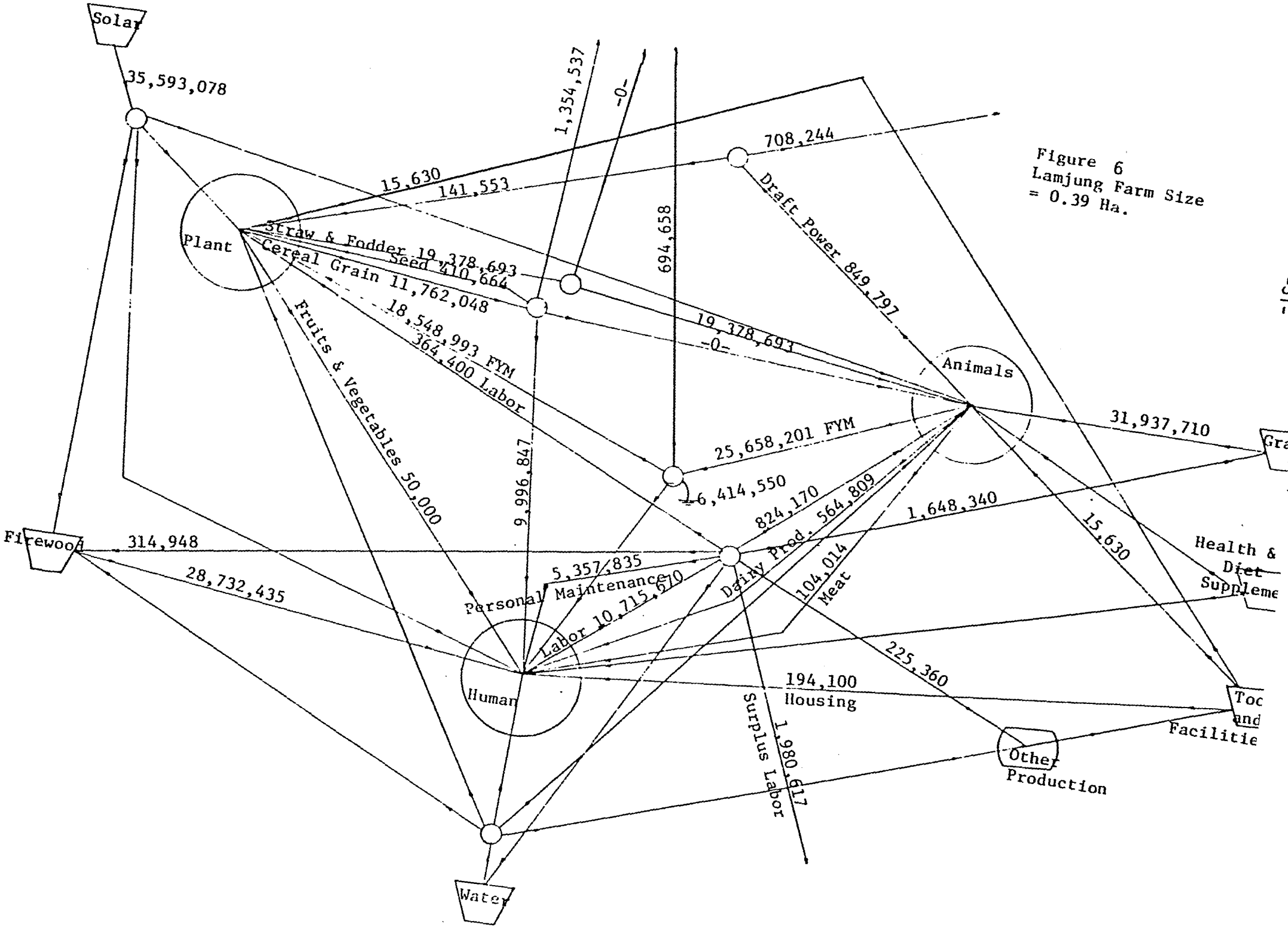


Figure 6
Lamjung Farm Size
= 0.39 Ha.

Table 6.-- Gross Approximation of Total Materials and Energy Flow in Farm Family Ecosystems and their Near Environment by Size of Land Holdings, Sundar Bazaar, Lamjung District, Nepal, 1977

Number of Families	Average Size of Land Holding (Hectares)	Total Material and Energy Flow per Hectare in KCals (x000)	Total Material and Energy Flow per Farm Family (in KCals x000)
16	0.17	185,907.6	31,604.3
17	0.39	130,389.4	50,851.9
16	0.62	113,211.8	70,191.3
17	1.20	68,721.9	82,466.3
4	4.06	23,612.8	95,868.0

Table 7 -- Recycling Ratios* for some farms in Nepal. Based on data from 70 farms in Lamjung District collected in 1977.

Number of Farms	Average Size of Farm in (Hectares)	Recycling Ratio
	Lamjung District	
16	0.17	90.55
17	0.39	96.37
16	0.62	94.83
17	1.20	91.79
4	4.06	77.09

* The Recycling Ratio is the proportion of total materials and energy flow into, within, and out of a family ecosystem which is recycled within the system (exclusive of solar energy).

Correlation:

Lamjung r = -.93

farm rather than "exported" from the farm, or "imported" to the farm. As Table 7 illustrates, the smaller farms have the higher recycling ratios, and the larger farms have the lower recycling ratios. There is an inverse relationship between the recycling ratio and the size of farm. Correlation is -.93 for Lamjung District.

In Lamjung District, the very smallest farming systems, which send out both labor and draft power and bring in cereal grain, have a slightly lower recycling ratio than the next three groups, but all four major groups in this district (66 of the 70 farms studied) recycle more than 90 percent of their total materials and energy flow. As might be expected, the four "over size" farms, which don't seem to fit the rest of the Lamjung group have a significantly lower recycling ratio at 77.09.

The second smallest group of farms in the Lamjung area, averaging 0.39 hectare per farm, have the highest recycling ratio (96.37 percent),

approaching what might be labeled complete subsistence agriculture at 100 percent. From there, as the farm size grows, the recycling ratio diminishes.

The recycling ratio was defined as an index of functional differentiation, and these data tend to validate it as such an index. To the extent that it is a valid indicator of functional differentiation, the data presented in Table 7 support the hypothesis that there is a positive correlation between size of farm and functional differentiation. The data presented in Table 6 support the hypothesis that there is a positive correlation between size of farm and quantity of energy transformed. By logic, we infer that there must be a positive correlation between energy transformation and functional differentiation.

Discussion in Relation to Other Rural Social Systems

The positive correlation between quantities of energy transformed and functional differentiation is reflected in information available about other types of farm family ecosystems in other parts of the world. In the highly commercialized large scale mono-crop agriculture of Michigan, for example, indications are that farm family ecosystems may have recycling ratios as low as 2 to 5. Almost all inputs are purchased on a commerical market, and close to 100 percent of the energy value of farm production is sold to specialized marketing firms outside. Wheat producers will purchase bread from outside, and dairy farm families may buy homogenized milk. They have not only differentiated (specialized) the production function, eliminating supply and marketing, but they tend to have further specialized to fewer and fewer different farm products. In quest of economies of scale, they have further differentiated the production function. (Tumala and Connor, 1973).

In the opposite direction, low income pastoralists in the Rift valley of Kenya tend to have even higher recycling ratios than the small mixed

farmers of Nepal. The pastoralist family ecosystems must move with the rains, continually seeking water and grazing for their cattle, sheep, goats, and donkeys. As they move from one location to another, they take their whole families, all livestock, their homes (tents, etc.) and all other worldly goods with them. Such groups live on the milk (and blood) of their cattle, and the meat of their sheep and goats. Only small and supplementary inputs like salt are purchased from outside. In times of drought some grain or other foodstuffs might have to be purchased. On those occasions livestock must be sold or bartered. Normally, however, if there is any surplus, livestock numbers are increased. They represent savings, or family wealth. With no travelling banks or other investment possibilities, even surpluses are recycled within. And with no travelling schools or health centers, most functions must be done by the relatively unspecialized, undifferentiated nomadic farm family. Therefore, recycling ratios may tend to be in the high eighties or over 90 percent.

By definition the higher the recycling ratio, the less the social differentiation. And the data presented above, as well as the international comparative experience tend to confirm that the less the social differentiation, the less the total quantities of energy transformation for each farm family ecosystem.

The Recycling Ratio in Social Impact Analysis

The conception of continuity and change in rural social systems as a cyclical phenomenon, based on the farm family ecosystem approach, can be useful for several different types of agricultural and developmental strategies.

1. From Agricultural to Farming Systems Research. Historically, the development of agricultural research systems has faced issues of social

control, rewards and sanctions, reference groups and which topics to study. One of the issues beginning in early organized efforts in Germany and Scotland, and continuing with the establishment of state experiment stations in the U.S.A. was whether to service the expressed needs of farmers, or let the growing scientific community decide which agricultural problems were appropriate for research. The formal research institutions have had to mediate not only between farmers' concerns and scientists' concerns, but also contend with the authority of public political-economic forces which provide their sustenance. The latter tend to reflect the changing nature and values of the larger social system (especially urban forces) and particularly its power structure.

Thus, as European and North American societies became increasingly differentiated and industrialized, and as the scientific community also became increasingly specialized, the nature of agricultural research reflected these trends. While this was perhaps appropriate in countries like the U.S.A., where highly specialized, large-scale, capital-intensive agriculture "fit" the larger social trends, it produced a style, mind-set and level of differentiation which made it quite "unfit" for relevance to the small-scale, undifferentiated labor-intensive farming systems in places like Nepal.

In the past three decades of agricultural research, the scientific community has had difficulty recognizing the fundamental differences between the types of farming systems found in much of Asia, Africa, and Latin America, and those found in North America and Europe. During the past century, North American and European farmers have shifted from relatively high recycling ratios to relatively low recycling ratios. They have become so low that studies of energy flow in Michigan in 1979, for

example, do not even take into account such factors as human labor and animal manure, since the energy values of "inputs" such as chemical fertilizer, diesel fuel, electricity and gasoline are so high that the other figures become insignificant by comparison.

The large scale, commercial, specialized and highly differentiated mono-crop agriculture of the industrial countries has its own problems. In response, its scientific community applied science to those problems and developed technologies which were appropriate. However, the attempt to transfer some of those technologies to the small scale, mixed-crop and livestock, labor intensive and capital-short agriculture of the so-called "developing countries" was a dysfunctional exercise. Usually, the attempts at technology transfer failed. When the technology transfer succeeded, sometimes the problems which were caused tended to defeat long run "developmental" goals.

Perhaps the recycling ratio can inform agricultural research of the nature of the problems which would be appropriate to study for any particular type of agriculture. The aspiration is that science applied to the type of agriculture in which most materials and energy are recycled within would result in technologies that would be less dominated by goals of increasing production, and more concerned with reducing storage losses, increasing consumption, and increasing equity among various members of rural social systems.

The assumption of a cycle of change, rather than the linear "progress" model, may encourage more historical analysis in agricultural research, and could reveal much from the past which might be useful in the future.

Similarly, the conception of a farm family ecosystem, with change in any component affecting and constrained by the condition of all other

components, may be useful to agricultural researchers who are turning toward farming systems approaches. A farming systems perspective should enhance the capacity of the highly specialized scientific community to relate to relatively undifferentiated types of agriculture by adjusting the research agenda with different approaches to problem definition.

For example, the issue of the advantages and disadvantages of small garden tractors as substitutes for animal draft power is a subject for agricultural research. However, when only cash flow data are used, the analysis may lead to a different evaluation than when all materials and energy flows are taken into account. Such matters as use of straw and other fodder by draft animals, allocation of child labor to livestock care, manure values, exchanges between the farm family ecosystem and its near environment, when entered into an evaluative equation, may produce different results.

Further, agricultural researchers are less likely to declare a new cereal grain selection to be "improved" if they consider more than the grain yield. If the recycling ratios of the farming system are taken into account, some varieties will be rejected even when their grain yield is high, because their fodder yield may be insufficient or their requirement for innovation in procurement of outside inputs may make them less than feasible.

2. Agricultural Extension Education perspectives might also be expanded by a farm family ecosystem perspective. For example, in areas where small farming systems have a very high recycling ratio, credit for purchase of inputs tends to be rejected or ignored by farmers. That is because they usually supply their own inputs, consume their own outputs, and do not require large amounts of credit for operation.

If those (outsiders) planning the agricultural extension programs had first analyzed such phenomena as revealed by the recycling ratio, alternative programs might have been proposed. Technological improvements in storage of home grown seed and farm yard manure are more promising than production credit to those with high recycling ratios. Similarly, there are many agricultural extension programs in South Asia which make the assumption that farm families keep dairy cattle primarily for milk. Based on that assumption, the programs are designed to help farmers increase the milk production of those cattle. The farm family ecosystem analysis reveals in some parts of Nepal, as an example, that the primary reason for keeping a cow is usually for the production of a male calf, which might some day supply draft power. The second reason is usually for the production of farm yard manure, which serves either as fertilizer or as fuel. For many families, milk production from their cows may be a third or even fourth (following certain religious functions) reason for keeping the cow. Such poorly planned extension education programs usually fail, thus avoiding any serious damage they might do to the farm family ecosystem. However, it is normal to blame the farmer, as an "ignorant peasant," for not following the program's recommendations, rather than to discover the weakness of the initial assumption.

Farm families with high recycling ratios can use many information inputs of agricultural extension education at the decision points which have been identified in Figure 1, as the small circles between the components of the farm family ecosystem.

Improved storage technology, for example, can stretch the harvest of grain to more adequately meet nutritional needs of the family through the whole year. New information on weather and resource variables can

contribute to planting and rotation decisions which will expand production to provide food and seed for the family.

Symbiotic relationships among plants traditionally intercropped, as well as between plants and animals, can be recognized by agricultural research and those practices supported by the research and extension professionals. This support can expand the development of the skills and abilities (human capital) of the small farm family.

3. International Development Assistance can also be informed both by the cyclical perspective and by the farm family ecosystem approach. The extent of functional differentiation, as well as the extent of energy transformation and nature of materials and energy flows all offer clues to outsiders as to what types of interventions are likely to be seen as "development" by insiders, as well as to provide strategic help in determining what is likely to succeed and what is more likely to fail. Examples of the failure to use this approach are much more plentiful than examples of success.

The normal international development assistance assumption, whether it be by host country nationals, by "donor" country staff, or by international organizations, has been that since development and modernization vary together along the straight line of advancing technology, whatever comes from the more "advanced" countries is obviously better for the so-called less developed countries. The fallacy is that in most cases a technology invented in one system to solve some of its problems is not likely to "fit" very well in another very different system. If it be introduced, like an animal organ transplant which is not appropriate for the new system, it is likely to be rejected, and may cause damage to the rest of the system into which it is introduced.

Typical examples are petroleum powered tractors, being introduced to small mixed farming systems of Asia and Africa. These technological "improvements" in large-scale, mono-crop, capital intensive farming systems tend to be rejected after introduction to small-scale, multiple crop and livestock, labor-intensive farming systems.

Beyond the mechanization example, which is so obvious in retrospect, there are many less obvious current examples. These include the promotion of increased cereal grain yields by extension systems controlled from central governments. It is often in the interest of government to increase production, since it is assumed this will increase food supplies, and perhaps reduce pressure on international exchange. However, it is just as often not in the interest of farm family ecosystems. Sometimes this is because the cost of such yield increases is in excess of the net gain to the system. There are many instances of this in situations where the only feasible way of achieving the increased yields is to increase chemical fertilizer inputs. With high costs of such fertilizer, the small mixed farming system is often better off when its yields are lower.

This type of intervention is sometimes encouraged by international technical assistance, in association with international agricultural research units. Since the rewards to professional staff within host countries are much larger from the international research network than they tend to be from the local bureaucracy, evaluations of foreign materials with foreign criteria result in local recommendations which may not be in the interest of local farmers. In fact, just as international reward systems and values overwhelm the national ones, both of these bureaucracies tend to overwhelm any influence small farmers might have on the nature of what is researched, what is extended, or what is the essence of international assistance programs.

There is some direct utility for socio-cultural impact analysis, and the assessment of the impact of outside interventions on social systems and their cultures. While progress is being made in this field, there has been a tendency for social and behavioral scientists to be comparatively "vague" and general in their findings, particularly when compared with biologists and economists. This has encouraged international banks, development agencies, and governments to turn more to the economic data and the agronomic information. Merely to know that certain customary practices may be in jeopardy because of the introduction of some new technology has not seemed to influence those supporting the projects as much as "hard" data about expected increases in income or agricultural yields. Demographers have been more convincing, but their data tend to be macro level, and less helpful for micro impact analysis.

Criteria in additon to cash flow and population trends are greatly needed if social scientists are to make a contribution in this area. There is so little documented about such phenomena as the social organization and administration of change agencies in the rural social systems of the world, that the opportunity for rural sociologists seems particularly bright.

The concept of a cycle, itself, suggests the need for more research on patterns of technological change, not only with recent innovations (which have been so attractive to rural sociologists), but historically, even going back to ancient times, further documentation of change from the highly differentiated to the less differentiated is needed. Analysis of how social change accompanied shifts toward less intensive exploitations of available energy resources, and the social dynamics of the technological changes involved, would have immediate utility in contemporary North America and Europe.

The field of urban-rural and rural-urban migrations also could exploit the cyclical conceptualization, by relating continuity and change in different parts of the world at different points in historical time to each other. Also, long-range migrations and short-range migration patterns might well be analyzed from the perspective of the social differentiation and energy transformation measures, and related to continuity and change in types of farming systems. Here the opportunity includes the assembly of studies by ethnologists, archeologists, historians, and others and making analyses from a rural social systems perspective. See, for example, E. Boulding (1976).

With respect to phenomena like the recycling ratio, more detailed field research would contribute significantly. The descriptive base needs much additional work.

Studies of the decision making process at the "trigger points" identified in the farm family ecosystem model might reveal continuity and change in values, and the value relationships associated with functional differentiation. The independence of a high recycling ratio versus the dependence associated with a low recycling ratio varies as a social goal from place to place and time to time. How any why this happens needs further study.

Parallels with local "basic human needs" criteria may be associated as much with the total quantities of materials and energy flow as with the proportion which is recycled. More analyses in more parts of the world would add significantly. Perhaps studies which identify opportunities for raising recycling ratios in farming systems in the United States, by such strategies as reducing energy inputs and diversifying functions should be explored?

Beyond the use of social differentiation and energy transformation analysis within individual farming systems, there is great opportunity for rural sociologists at the next levels of analysis of larger social systems. At the village level, it has been observed in this study that there is a social significance in the collection of forage for livestock from the near environment, and often from common pastures and forest lands. This results in inputs of manure for plant production and soil fertility which are obtained away from the individual family ecosystem. The relationships between individual family needs and values, and those of the larger community, can be explored much further with this type of analysis. The larger questions of energy transformations and materials flows at the community level, and linkages with the larger social system of which the community is a part, are already being studied. This conceptual framework may have utility for such investigators.

Detailed analysis in different agro-climatic zones, among different ethnic groups, and with different types of farming systems offer the rural sociologist research opportunity almost everywhere in the world. Among the objectives of such further research are the refinement and improvement of the methodologies described here, expanding the understanding of farm family ecosystems as systems, comparative studies of farm family ecosystems in different cultural and geographic locations, and providing a better base for international scientific and technical exchanges.

Limitations of Materials and Energy Flow Approach

There are several limitations to this type of analysis. The decision to consider off-farm grazing and grass cutting, as well as firewood gathering, to be part of the near environment, increases the recycling ratio.

The type of analysis reported above must be considered to be at a primitive stage. The opportunities for further work far outweigh the achievements thus far. Within individual farm family ecosystems, time-use studies such as our work in Nigeria (Axinn and Axinn, 1969) and detailed quantification of materials flow among the plant, human and animal components, would certainly contribute to validity. Further, the data were collected at each location at one point in time. Trend data over the months of a typical year, or a period of several years, would strengthen the perspective. And comparisons of different types of family farming systems using this sort of analysis would also be useful.

However, I have tried to demonstrate that it is possible to assess materials flow and energy transformation within small family farms, and among such farms in a rural social system. Assessments of such materials flow and energy transformation may be more valid as indicators of quality of life than assessments of the annual cash income which are so widely used at present.

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