LINKING ANIMALS TO HOUSEHOLD AND CROPPING SYSTEMS

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At the present time, Asian agriculture is faced with three major basic problems: (i) of population growth; (ii) diminishing farm lands; and (iii) low farm productivity. These problems are inter-related: as population multiplies and urbanization forces its way into the countrysides, the per capita farm land decreases. At the same time, the increasing population is resulting in fragmentation of farm lands into smaller units which is, in general, considered to be an unhealthy situation adversely affecting farm productivity.

In many developing countries of Asia, the size of an average farm holding is tending to get smaller and smaller. In several parts of Southeast Asia, the average farm is about 0.5 hectare. There is, however, ample evidence to suggest that high yielding technology is size neutral and that the small farm can also facilitate intensive agriculture.

The farmer with irrigation, while susceptible to farm size decrease and fragmentation like the rainfed farmer, is in a more favorable position to adopt new improved technologies. However, although such improved technologies tend to be "high-investment high-return" situations, they essentially assist the irrigated farmer in compensating for his loss of land or fragmentation by increasing farm productivity per unit area by crop intensification and/or diversification. In contrast, the effect of low farm productivity is more pronounced on the rainfed upland crop farms, especially on the small landholder. He faces many problems in the adoption of new, improved technologies, arising from the loss, risk and low return structure of his farming. In particular, the farmer in the marginally cultivated areas is unable to take the investment risks of inputs and/or land development. He is also subjected to various forms of exploitations at the marketing end of farm operations.

THE ROLE OF LIVESTOCK IN ASIAN FARMING SYSTEMS

A number of definitions have been attempted of what constitutes a farming system. Perhaps the definition wherein there seems to have been a general concensus is that suggested by the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR): "A farming system is not simply a collection of crops and animals to which one can apply this input or that and expect

immediate results. Rather, it is a complicated interwoven mesh of soils, plants, animals, implements, workers, other inputs, and environmental influences, with the strands held and manipulated by a person called the farmer who, given his aspiration and preferences, attempts to produce output from the inputs and technology available to him. It is the farmer's unique understanding of his immediate environment, both natural and socio-economic, that results in his farming system". In other words, the farming system includes the whole farm and its activities.

The recognition fairly recently by the scientific community that there is merit, after all, in multi-commodity farming -- long a practice among small farmers the world over, most particularly those in the congested countrysides of rural Asia who have had to make the most out of a small landholding and a rather large supply of family labor -- has led to the re-emergence of the integrated small farm system as an attractive concept on which to base rural development. In the rural setting, where landholdings are small, families are large, and farming practices are considered not quite modern, it has been generally assumed that the farm family can produce from the farm enough food only for its needs with barely any surplus to provide food for non-farming members in his community and to earn cash income.

In rural Asia, livestock is traditionally considered an integral part of most farming systems. For centuries, the small farmers have sustained themselves by practicing various kinds of crop diversification and integrated farming systems. Aside from crop production, most small farmers have such livestock as a few head of cattle or water buffalo, one or two pigs, and a small flock of ducks or chickens. Where there is adequate water supply, a small fish pond is maintained.

However, in almost all developing countries in Asia, there is a general realization that the animal feed supply is grossly inadequate to support current livestock numbers, that serious disease problems exist, that livestock support services are poor, and that livestock productivity is low. This situation is a serious constraint to improving farm output under almost all farming systems practiced in developing Asian countries, particularly those with high human population density. Since livestock are well integrated into Asian farming systems, livestock health and performance have a direct effect on the nutrition, income, and welfare of most farmers, particularly the small farmer. Very often, the growing of pasture and fodder crops is severely limited by human demand for food.

Considering the current situation in Asian agriculture and its attendant constraints in most developing countries of Asia, where human population density is among the highest in the world, floods and other natural disasters are common occurences, literacy level is low, and rural poverty is pervasive, a number of opportunities emerge for the livestock sector to provide a meaningful contribution to the development goals of rural Asia. These are:

1) providing farm power for draft purposes;

2) generating additional employment opportunities for landless laborers as well as rural women;

3) producing high-value protein food without having to sacrifice land used for food crop production;

4) maximizing the use of the total available resources on the farm;

5) the production of meat, milk, or eggs either for sale or for home consumption; and

6) the production of livestock by-products such as hides, feathers, bones, etc.

In the Philippines, in terms of livestock supply, the country's latest inventory shows that backyard farms contributed eight out of every ten head of the livestock and poultry population in the country (Colanta, et al 1983). As in most of rural Asia, Philippine agriculture is characterized by the predominance of small-scale farmers with average landholdings 3.6 hectares (more than 50% of Asian farmers have less than one hectare, 90% have less than five). Some 500,000 Filipino farm families are in fisheries and livestock production. Needless to say, the bottom figure for the livestock industry was, in 1979-1981, an average negative trade balance of 2.5 million US dollars per year, due largely to sizable importations of dairy products and feedstuffs.

Elsewhere in Asia, the situation appears to be not much different: subsistence and marginal farms predominate and the only substantial available inputs are labor, solar energy, and, in varying degrees, water. However, in most small farms, the quantity of by-products and waste materials turned out from the operations normally exceeds the quantity of the food or farm commodity being produced. A study of cropping systems in the Philippines showed that the amount of by-products can be as high or higher than the marketable produce which, according to the researcher (Carandang, 1980), could go to waste "if not utilized in an animal enterprise." This -- wastes and by-products -- is one valuable farm resource that has largely been underutilized in small Asian farms.

A scan of several small Asian farming communities tends to strengthen the assumption that, while farmers have long been practicing multi-commodity farming, they have been doing so largely with little systematic effort. Thus, while they have survived, productivity has remained low and levels of farm output have generally remained only a little over that of subsistence.

SOME PREVIOUS FINDINGS AND RECOMMENDATIONS

A multi-commodity farming system presents more advantages to farmers than a mono-cropping system. However, the commodity mix must fit into the particular farmer's capability, resources, and needs as well as the social, economic and environmental forces around him.

An expert group meeting convened by FAO in Bangkok in June 1976 discussed several case studies in crop-livestock integration at the small farm level.

Some of their findings include the following:

1. A need to reorient programs and policies biased towards the smal farmers.

2. Failures in development traced to inappropriate policy -- for instance, pursuance of monoculture or single activity approach; inappropriate borrowed technology to suit large scale or commercial production without any consideration for local potentials; inadequate knowledge for exploiting local resources among the technicians and neglect of indigenous knowledge and inputs; adaption of technology that would create almost permanent dependency on industrialized countries; institutional deficiencies especially land institutions; and lack of suitable support service and failure to understand human resources as a major form of capital available in agriculture.

3. Crop-livestock integration is the most effective and possible way to help the small farmer who has a small landbase but surplus labor.

4. The wide differences in the region's agro-climatic situations, as well as differences within the countries themselves, would require the formulation of different sets of activities to suit these various conditions i.e., heavy rainfall areas, dry areas, hill areas, lowlands, uplands, and tree-crop plantations.

5. It was also pointed out that there are several animals and fowls that have not received due attention.

The same group of experts recommended the following which we may find relevant to our problem:

> Firstly, there must be fuller utilization of local crop by-products as it is one of the most promising means by which water buffalo and goat production can be produced economically with a limited landbase. It was, however, recognized that constraints, such as lack of suitable technology and lack of the required mechanism for supporting services will have to be overcome before these programs can be successfully implemented. The experts noted that labor intensive production systems should be emphasized considering the available surplus labor in the family farming system.
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> Secondly, a cropping pattern and livestock integration plan should be worked out in consultation with the farmer who has to implement the plan.
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> Thirdly, in working out an integration system, attention must be given to the total farm resource (i.e. feed and fodder in the case of livestock integration into a cropping system) of the farmer; we should consider the farm by-products, their collection, treatment and conservation; and
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> Fourthly, they suggested that national institutions look further into small farmers' problems and develop suitable technology applicable to the small farmer and farm laborer family production system.

There is general agreement that the most appropriate strategy for optimizing the impact of livestock in the development of Asian agriculture is to utilize most efficiently the basic natural resources of solar energy, atmospheric nitrogen, rainfall, and the latent skills developed by the farming population over the years, in order to increase food production per unit of time and per unit of area, taking advantage of all available resources and avoiding waste through a system of recycling.

A workable pattern of integrated small-scale farming is probably best exemplified by the well-known Chinese small-scale farming system. The small farm raises pigs and/or ducks, in addition to crops, rotated in accordance with the seasonal climatic cycle. The animals, particularly ducks and pigs, are sources of animal protein, in addition to the fish. Pigs are fed with aquatic plants combined with kitchen leftovers, and animal manure serves as fertilizer for the crops, vegetables and fish ponds. This is a system where practically nothing is wasted. An ecological balance is maintained and a sufficient variety of products are obtained to meet the farm family's needs in terms of foods and cash income. This practice and a variety of other integrated

farming systems continue to be used in many Asian countries: each system developed mainly through long years of experience of individual farmers.

THE SMALL-SCALE INTEGRATED FAMILY FARM SYSTEM MODEL

Recently, in Bangladesh, testing at the field level of a small-scale "integrated family farm" has been initiated by the Bangladesh Agricultural Research Council (BARC) working in close collaboration with the Danish International Development Agency (DANIDA). The analysis of the farm models indicates that an integrated family farm in a high population density country like Bangladesh involving a total farm area of 0.7 hectares, besides feeding the family (estimated at 6 persons), will also provide a food surplus sufficient for 20 more people. However, the integrated farming system is reported to be also functional on an area of 0.25 hectare, providing residues for feeding of one cow, food for the family with six members, and food surplus for another 3 people.

In this scheme, the estimated potential is reached by introduction of multi-purpose crops, multi-purpose animals, multi-purpose ponds, and a digester unit. Although the production potential may vary perhaps by some 30 percent, the flexibility in the integrated family farm system is a guarantee that productivity will be maintained at a high level.

The initiation of the integrated system may require small amounts of fertilizer during the first 1 - 2 years, principally urea nitrogen and phosphorus. Later, the production system would be closed, using only solar energy (utilized by continuous cropping), atmospheric nitrogen (through nitrogen-fixing legumes, water plants, or blue-green algae) and the rainfall (by extending the pond area for irrigation).

Food production is increased mainly by a prolonged cropping system, but the recycling of harvested crop residues through cattle, fish and a digester also plays an important role in generating energy through draft power and biogas, as well as saving on costs of expensive chemical fertilizer.

The land utilization pattern in the integrated family farm involves: 5,000 sq. m. for crops; 400 sq.m. for vegetables; 300 sq.m. for a fish pond; 900 sq.m. for water storage; 60 sq.m. for livestock sheds; and 195 sq.m. allotted for the farmyard; all totalling some 7000 sq.m. or 0.7 hectare.

Livestock sub-unit of intograted family farm

The annual draft power requirement of the proposed cropping sequence is estimated at 60 days for land preparation. This is not sufficient to justify the keeping of specialist work bullocks on a permanent basis. Multi-purpose cows are believed to be more appropriate

and these are proposed for this family farm. Because the cows would be providing draft power (40 days per year), it is estimated that they will calve only once every second year. Thus, each year one calf is born and one cow will be lactating (part of the year only). Therefore, in addition to the two cows, there will be one calf and one growing animal (1-2 years).

The remaining livestock would be a flock of 10 hens and 1 cock of native local chickens. These will be fed partly by scavenging in the farm yard and crop area. A small flock of seven ducks will also be kept.

The principal feed of the cattle would be harvested crop residues, which are expected to contribute annually some 5,850 kg dry matter containing 44 kg nitrogen. This will be supplementarily balanced by the forage from ipil-ipil (lucaena) leaves from the hedge and the Azolla from the ponds.

Projected annual farm output

The integrated family farm involving 0.7 hectare is expected to bring about an annual output of crop products, livestock products, fish products, and energy products for fuel a well as draft power. Crop production is projected to include: 2,500 kg. of rice; 600 kg. of wheat; 250 kg. of field beans; 200 kg. of peanut; 2,500 kg. of potato; and 350 kg. of corn. Livestock products include: 200 kg. of milk; 75 kg. of beef; 132 kg. of chicken meat; 8 kg. of hen eggs; 102 kg. of duckling meat; 22 kg. of duck eggs; 15 kg.of adult hens; and 12 kg. of adult ducks. The fish pond is expected to produce some 300 kg. of fish. Energy production includes 40 days of draft power; 1.5 cu.m. of biogas energy; 5.4 cu.m. of liquid fertilizer; and ipil-ipil wood for fuel.

Need for focus on farmers' community development

It is generally accepted that the three criteria for an innovative project to be successful are: a) it must generate economic effects sufficient to justify its adoption in terms of the conventional appraisal calculus; b) it must create social and distributive effects consistent with the rural development strategy; and c) it must promise a continuing development effect which sustains change in a desired direction throughout the rural system.

Three requirements have been identified to meet these criteria for success. First, a technological package suited to the particular development purpose; second, a rural system conducive to the reception and adoption of this technological package; and third, management of the ensuing change process on a continuing basis. It is assumed that the generation and adoption of new farming technology cannot be left

entirely to chance and must therefore be fostered by concerted policies and investment activities on the part of national government and development agencies.

We are reminded that the first requirement for successful innovation is the availability of a package of technical components that is complete, reliable and properly designed for the condition within which it is to be applied. Second, the package of technology must be consistent with the human attributes, attitudes and abilities in the region, since farming is not solely a technical system but is one in which social attitudes have a pervasive influence. A third requirement is to include an information component in a development project. This is based on the fact that innovation represents the introduction of novel inputs and methods into the farming systems; therefore, a project may be ineffective or even dangerous in the absence of appropriate knowledge, or even in an incomplete form. Finally, it is deemed essential that newly introduced technology must have a high probability of technical success at its first trial, and must be perceived to offer reliability. This is certainly necessary to protect the welfare of the innovating farmer and to serve as an effective demonstration to encourage adoption and continued use.

Development revolves around people. While technology and a favorable social and physical environment are needed to accelerate progress, the fact remains that it is people who develop themselves. This is not to say that the people should be left on their own, since one should enhance the environment for development, provide the opportunity for change, introduce the motivation to improve, and generate the will to move up from poverty. In brief, the general approach should be the mobilization of the human and natural resources found in a given geographical area in order to enable the farmers to produce more, obtain a higher farm income, and, in the end, develop self-reliance. Thus, it becomes quite evident that development work must deal not only with the individual farmer, or a cluster of farmers, but with the entire farming community in a given locality. The entire farming community is looked at as a system of which the individual farmer is a part. Within this system are the various interlinks among people and among factors of production, and the numerous interactions between people, resources and opportunities. Consequently, this development system aims at optimizing the available resources in a given farmers' community setting by identifying and undertaking the best suitable farming system and enterprise mix. Then, it looks at this farming community as yet only a part of a greater system -- the bigger society from which other resources, other controls, other opportunities, and other influences emanate to affect the behavior and performance of the community. Essentially, all these internal and external factors combine to shape the development of a given farmers' community.

RESOURCE MANAGEMENT CONCEPT

It is important that a technology that should finally be promoted for adoption must itself be evolved from the farms with the participation of the farmers themselves. This would take care of the requirements of location -- and situation -- specificity: to be shaped by the existing socioeconomic conditions and farmer's attitudes and to be simple and tailored to fit the management environment and resources of the farmers. A mechanism is, therefore, necessary to institutionalize and coordinate within the national system of the evolution and transfer of appropriate integrated farming systems for different rural situations. This calls for a concept and a machinery to integrate the technology with the general scheme and mainstream of area development activities now going on in various countries.

An integrated farming system should be looked at in terms of an industry model. Designed as an industry development support scheme, the model consists of three components, namely: the production support component, production component, and marketing component. The production support and the marketing subsystems are the macro-components while the production subsystem -- which in the model consists of the various individual integrated farming system enterprises -- is considered and treated as the micro-component. The macro-components consider the process by which production may be increased effectively and more profitably.

Production support includes the delivery and provision of production inputs like stock or seed, feeds, fertilizers, credit, the technology as well as component and relevant information about it, and the industry infrastructure. The production units are essentially composed of the farmers themselves who would have to be organized into associations or cooperatives. The third subsystem includes the post-harvest handling and treatment, marketing, processing, storage and distribution of the outputs. This would enable the producers to take optimum advantage of market opportunities.

While the scheme could be worked out at the village level, it can very well be translated and operationalized into a wider area development project. It would need an integrated approach to the development of the multi-commodity-based farming system. Such an integration will be worked out by the various institutions that provide the different support services as identified in the model's two macro-component systems, i.e., extension, research and development, markets, farm input suppliers, banks and lending institutions, etc.

A mechanism to link the production units (the farmers) back to the production support system and forward to the marketing system would have to be forged for an integrated area approach to integrated farming systems development. The nature and function of such linking and integrative mechanisms must consider the proposition that the multi-commodity farming system is a single unified farming enterprise composed of different complementary commodities.

While it sounds easy to put into conceptual form, the possibility arises for integration to be doubly complicated by the competition among the commodity components for resources, both within a single enterprise and, more specifically, among multi-commodity-producing farmers in a given area. This problem will have to be partially resolved by thorough economic and agribusiness-viability studies on the comparative profitability of the different commodities that compose the farming systems and by a rigid testing of the technology component of the entire technology package. This would necessarily involve the setting up of technology verification and packaging programs as an integral part of the development of the multi-commodity farming technology. Results of verification studies can be packaged and refined further for subsequent recommendations to farmers in the area whose situations, conditions, and socioeconomic patterns are similar to those in the area where the tests had been conducted.

Going back to the expert group meeting in Bangkok in June 1976, the following recommendations were made for specific activities and support services:

1. Simple and low-cost management practices should be developed and promoted considering that small farmers and agricultural laborers find new technologies and management practices alien to their needs and understanding.

2. In training, there is a need to make training programs practical and aimed at real problem-solving for villagelevel workers. The trainees must be exposed thoroughly to local problems and prospects of small farm products. Training programs should be conducted in the village and in farmers' household areas. Further, the training for small farmers to prepare them to receive new technology and management skills should be enhanced. Government agencies and officials as well as the extension staff must be reoriented towards the new approach of providing services to small farmers in an integrated, instead of piece-meal manner.

3. As to the support services, the recommendation was to provide credit, marketing and extension through group organizations. This recognizes the well-known fact that, individually, small farmers have weak bargaining power. One recommendation is to have special credit programs earmarked exclusively for the small farmers. On top of this, appropriate price policy measures for the farm products should be adopted to encourage production at the small farm level.

INTEGRATED FARMING AS A BUSINESS

Dr. Mosher has drawn a simple but appropriate model to help us take a closer look at an integrated farming system as a business. The farm business, says Mosher, is really a combination of farm enterprises which: 1) support each other, 2) distribute labor requirements, and 3) jointly determine farm income.

He reminds us that the farmer cannot simply select individual enterprises for his farm business without considering them in relation to one another. These enterprises are full of "joint products" and "joint costs" (i.e., manure from livestock may be used to fertilize cropland; a cereal also produces straw for feeding livestock; etc.), which would then preclude the separation, both in the accounting and research and development sense, of the enterprises that compose the farm business. Each farmer would try to work out the best combination of commodities for his own farm business, considering the land, labor and other resources available to him.

The farmer's choice of the enterprise is what really complicates the integrated farm business. His choice is generally influenced by how he thinks of the costs and returns -- whether in terms of the cash value of the harvest or in relation to his position and responsibility in the community.

On the other hand, Mosher points out that if the farm family consumes most of the products of its own farm, its need for the food in its customary diet and for other products of the farm will be the major factor in its choice of farm enterprises. And, to the extent that products are grown for sale, the choice of enterprises will be influenced by the accessibility of markets for different products and by their relative market prices.

In other words, the farm product mix may not only be influenced by purely economic forces but also by sociological factors. It is thus necessary to find out what commodity mix fits into the particular farmer's capability, resources, and needs as well as the social, economic and environmental forces around him.

FARMERS' ORGANIZATION

Technology packages introduced into a development program stand a greater chance of acceptance and establishment if the community were to be involved in the development of the package and the design and implementation of the program.

Results of sociological studies conducted in developing countries have almost always brought to the fore one glaring fact: that the people were generally "talked to and rarely listened to." This notwithstanding the fact that in the complex field of rural development,

the guiding principle should be: "Start with what they (the people) know and build on what they have."

In the decision-making process, particularly in the planning of a project intended to improve the lives of rural people, the intended beneficiaries' participation is indispensable. But the sad thing is that government policymakers and development planners still nurture some apprehensions on the practicability of involving the people in charting programs intended for them.

Of course, their apprehension has basis. For instance, as a Filipino sociologist and communication researcher (Mercado, 1983) has noted, the participatory planning approach makes planning difficult to manage considering that the participants are multi-sectoral. As such, the exercise deals with a heterogenous group whose members have varied perceptions, skills and interests, which makes management of participatory planning usually extremely difficult.

Another issue raised against this process is that it is time, money and effort consuming. With so many individuals of varied and sometimes conflicting interests involved in the participatory planning process, more time, money and effort are spent in charting a program than in the traditional "planning-from-the-top" process.

But experience of development organizations and institutions have shown that it pays to involve the people in planning activities intended for them. Among these, as listed by Mercado, are the following:

1. It is an educational process. This means that the participants -- which include rural people and field workers -- learn more about the project than in the traditional planning process.

2. It increases acceptance of the project by the people themselves since they were involved in its design.

3. It generates more pragmatic solutions to the problems since the process takes into consideration the capabilities of the target clientele themselves.

4. It hastens the implementation of the project.

5. It reduces social cost.

The Comilla District (Bangladesh) experience on an integrated rural development program has also shown that a strong local authority can elicit better participation than officials who represent and are responsible to a remote authority.

Generally, a strong farmers' association would enhance, first of all, their bargaining position and, of equal importance, would enable the farmers to take advantage of the market opportunities. As pointed out in a study (Librero 1978) of the Philippines' aquaculture industry, the small farmers are mostly the victims of the vagaries of the market because they lack withholding power, which means the ability of producers to retain productivity in the market when prices are unfavorable.

Another reason for farmers' organization is to have central point of contact for the provision of services (such as credit) whereby the organization will have a collecting responsibility for the proper utilization and repayment of loans. Information delivery and training schemes would likewise be enhanced if they involve an organized group with common problems, interests, and needs. The final reason is that these organizations provide the management inputs for the production units in an integrated industry development scheme.

In recapitulation, the need to utilize more efficiently available farm resources has led to the increased attention towards farming systems that integrate more than one commodity. The multi-commodity farming system is the latest thrust among the integrated farming concepts and holds a great deal of promise for small farmers in Asia.

For successful implementation of this practice in the rural Asian setting, the following requirements are needed, aside from having a good and proven technological package:

1. The technology for this farming system must be verified at the farm level in specific locations and situations under various agroclimatic zones.

2. While the technology package must be tailored to the farmers, the situations and conditions at the farmer's level may have to be also modified where appropriate to enhance the reception and application of the technology.

3. Integrated multi-commodity farms could best operate if these are placed into the mainstream of area development. To do this effectively would need an approach designed to bring the small farming units into a scheme in which they are an integral part of the agricultural industry of an area. In such a way, efforts are organized and coordinated among the various institutions to provide the needed support services for production and marketing.

4. Finally, to provide a strong base for the application of the integrated farming system technology, farmers must be organized into strong production units and be provided, through effective training and extension programs, with a capability to fully utilize the technology as well as manage the program.

In the Asian rural scene, farm animals hold much promise for an improved and more systematic crop-livestock integration. Chickens, goats, cattle, buffaloes, hogs (in non-Muslim families) and ducks are common household animals being raised on farm and household by-products, with varying degrees of scientific care, to provide the extra source of income, or, during festivals and special occasions, to be readily cooked and served to kinfolks and guests without having to spend or borrow money.

The farm families have learned to integrate them not only in their farming system but also in their lifestyle. Finally, however, a socio-economic issue has surfaced in the light of recent attempts to bring "more system and science" into their present farming ways.

As the subsistence family is helped along into the mainstream of the business of agriculture, it can also become more sensitive to the market forces. While, at their present level of farming, the farm family may not be contributing much to the national product, at least it is relatively stable: it produces, from its traditional standpoint, enough to feed itself, the farm family provides the labor, and all seems well in their small farm world.

The question is, "will technology and policy protect the farm family from economic forces that might turn out to be socially disruptive to them should they begin to operate with a lot of new-found dependence on their farm unit?"

The merits and disadvantages, at this point, may still be debatable. The point remains, however, that the productivity of the Asian farm family needs to be improved and there are avenues open for doing so.

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