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Indigenous Technology and Agricultural Research System

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In memorium .....

On the occasion of first death anniversary of Prof. Dayanatha Jha, Agricultural Economics Research Association (AERA), India, pays its homage to this pioneering agricultural economist by disseminating one of his unpublished pieces of research work, contributed by one of AERA members. The AERA thanks the contributor and invites such unpublished pioneering research works/lectures from the members for publication in *Agricultural Economics Research Review*.

Managing Editor

Introduction

Beginnings of formal agricultural research and extension systems in the country aimed at exploiting indigenous or traditional technologies. Even within traditional systems, gaps existed between 'good' and 'bad' farmers and practices. Both research and extension systems sought to exploit the 'good' practices.

These technologies have five major characteristics. First, they have low capital intensity, whatever capital is built up (like bunds, terraces, wells) are laboresque. They focus on improving quality of management (operations) and materials (seeds, land, tools, etc.). In capital-starved surplus labour, traditional agricultural system, this meshes ideally with relative factor scarcities. Second, since these are usually environment- and ecology-friendly, these are sustainable. There are rice fields in the Indo-Gangetic Plains which have been in cultivation for very long time and produced stable output for centuries. Third, these are generally very location- and site-specific and have limited adaptability. That is why these are rarely noticed by outsiders in a macro-oriented and constrained information system. Fourth, over time, these diffuse over small, homogenous zones or sub-zones, mainly by farmer-to-farmer interaction. Since farmers as a group have a very low propensity for mobility, the diffusion area is further constrained. It is left to the few adventurous and pilgrimage-prone farmers, to collect varieties and ideas during their long journeys. Finally, indigenous innovations generally generate only small increments in output. Usually, they relate to one or two practices and not the whole package. This micro-orientation implies that the gains arise only from small interaction effects. Thus, during the first half of the twentieth century when there was practically no external source for technological change, agricultural output grew only at less than 0.1 per cent per annum, and that too primarily on account of systematic expansion of labour and land.

Because of these characteristics, indigenous innovations create practically no visible ripples. In a highly chance-dependent agricultural system, it is very difficult to detect these improvements and distinguish between output fluctuations due to weather and due to technological improvements. Those who work with aggregative district/state/national data on production and yields, for example, find it impossible to descern the effects of these innovations. This and the advent of 'dramatic impact' variables like irrigation, chemical fertilizers, and modern varieties, led to a complete neglect of indigenous technology as a source of productivity growth. Indeed, professionals in agriculture developed a negative perception of farmers' practices and farmers.

Revival

Since mid-1970s, arising out of a series of studies on adoption and diffusion and constraints or gap analyses, there has been a revival of interest in farming systems and participatory research. Scientists and other professionals began to reluctantly admit that farmers have valid reasons for rejecting their recommendations and doing what they do. The farming system approach explicitly recognizes the need, first, to adapt innovations to farmers' conditions and, second, to involve farmers and extension functionaries in this process. Various operational alternatives of this concept have been tried in different countries.

The need to take a fresh look at indigenous technologies in general was also prompted by two other developments. First, in the field of medicine and human health, it was found that indigenous practices and traditional wisdom were generally more human-friendly than other modern alternatives. Second, in natural (particularly agricultural) resource exploitation, the indigenous techniques were more environment-friendly and sustainable.

Direct Contributions

What contributions indigenous technologies can make in the present context? To begin with, the lessons derived by Hopper in 1965 are still relevant. Even within a village there is a wide variation in techniques and outputs and the gap between 'frontier' and 'lagging' yields is quite large even with traditional technology[1].

It is remarkable that even within a village some profitable enterprises can be successfully produced by only specified groups of farmers. Livestock and vegetables come to mind immediately. So long as markets were small and closed, these enterprises generated very small returns and only specified groups of farmers specialized in them, eking out a subsistence from very meager land resources. Now these have become highly profitable but this indigenous technology does not move to other farmers. How can more farmers be brought closer to these local frontiers? This will require highly decentralized research and extension. The subtle technical niceties will have to be identified, researched, and explained to farmers. In this context, indigenous technologies have an important contribution to make. In order to achieve this we will have to, somehow, develop mechanism and approaches which will allow the 'professionals' to learn from the 'practitioners'.

As a digression, it is submitted that the professionals are systematically brainwashed during their training with the notion that all farmers' practices are traditional and non-scientific. If you want to do something for agriculture, do it in laboratories and experimental farms and then teach farmers to follow them. Professionals who are trained in this vein find it very difficult to unlearn this lession.

Second, and perhaps more significant, is the potential for spatial transfer of indigenous technologies and skills. Historically, this has been the major source of technological change and progress in agriculture. Plant species of economic importance moved across countries and continents. In recent times too, this movement has continued and become more sophisticated. Apart from plant introductions agricultural production has benefited from other imported techniques also. It is paradoxical that we spend time and resources to facilitate such borrowings from all over the world but we do not bother about exploring the potential of transfer of indigenous techniques (other than plant materials). One wonders what contributions have been made by skills and techniques of labourers from eastern Indian to rice production in Punjab and Haryana. It would be naïve to assume that their contribution has been confined to labour only. What could Punjab farmers contribute towards wheat production in other regions? We must think of incorporating this in formal technology transfer mechanisms.

Those of us who participated in the earlier years of extension effort would recall that there used to be a provision of study tours for progressive farmers, primarily to expose them to innovations and practices of farmers in other states. The programme, not surprisingly was heavily concentrated towards trips to research stations. Over time, the study component became diluted and eventually the tours also

[1] Hopper, W.D. (1965) Mainsprings of agricultural growth in India, *Indian Journal of Agricultural Sciences*, **35**(2).

disappeared. We should design suitable innovative programmes which will promote these objectives.

Indirect Contributions

From the point of view of the national research system, a sharp focus on indigenous technology would bring greater relevance to research, particularly at regional or zonal levels. Relevance is the strongest point of indigenous techniques and technologies, and when researchers use this as the starting point of their own systematic research efforts, relevance would be built in their programmes. This point is of far reaching significance. Research on technology transfer mechanisms and experiences in India is replete with findings that more often than not, failures arise because innovations are inconsistent with the constraints set (environmental, socio-economic, cultural) of farmers. Indigenous technologies which arise from within this mileage are, by definition, fully consistent. It has been grossly imprudent on our part to ignore this logic.

It is interesting to speculate on why this happened. Until the import of high-yielding varieties in the early-1960s, the national research system was working with indigenous materials and, as expected, was able to generate modest technological gains. Fertilizer was the only high productivity input, it was alien to indigenous system and in any case, its use was negligible. These experiences reinforced the disillusionment of scientists with 'native' practices. They looked westwards and oriented their programmes in 'modern' directions. Thanks to massive technical assistance, a sizeable number of scientists were trained in western institutions in the late-1950s and early-1960s and these people (and their disciples) promoted this trend. 'Scientific' and 'traditional' became contradictory terms. This was further reinforced by Schultz's seminal work on transforming traditional agriculture which argued that the traditional farming system was in low-output equilibrium and, left on its own, was not likely to generate significant production gains. Massive investments in physical and human capital were required and the entire development ethos and strategy took this swing. The success of green revolution supported this concept. It became less and less and was fashionable (and rewarding) to pursue farmer-based research strategies.

Coming back to our concern on benefits, it is now clear that, for high pay-offs research must be decentralized. It must also be built from the strong base of indigenous technology. One could also argue that this approach would make research less costly. A lot of costs associated with adaptation would be unnecessary because it is built in indigenous technology.

Needed Changes in Technology Policies

1. It is well-recognised that agricultural research must be decentralized. This is the rationale behind the National Agricultural Research Project (NARP) which seeks to strengthen research capacity at regional and zonal levels. It makes sense to introduce the concept of indigenous technology documentation and evaluation at this level. Just as we have a benchmark survey to establish initial conditions before a change is introduced, we need to have a benchmark assessment of indigenous technology. This will form the basis for designing further improvements. This should be an essential feature of research planning under NARP. We ought to develop a methodology for indigenous technology evaluation and of integrating this with formal research programmes of the unit.
2. Equally important would be changes in agricultural education policy. The curricula and training programmes will have to be re-oriented towards appreciation and understanding of indigenous technologies and practices and of traditional farming systems. We need to create a generation of agricultural scientists and professionals who do not equate traditional with non-scientific, who are specialists but not myopic, who are cognizant of farmers' strengths, and who perceive farmers as partners. This is not a plea against specialization. Indeed first rate science demands specialization. What we should aim at in our educational programmes is

providing the above perspective and appreciation even as we are training specialists.

3. Changes are needed in the extension system also. First, this kind of activity should be one of the core activities of the *Krishi Vigyan Kendras*. These units will benefit greatly by incorporating tips from indigenous technology in their training programmes. Second, an imaginative programme of farmers' tours needs to be designed and incorporated as regular extension activity. These should be specific to an enterprise, cover an appropriate location of excellence for that enterprise, be conducted during the growing season, and provide ample time for participants to observe and interact with their counterparts.

Limits of Indigenous Technology

Lest one interprets all this as an extreme view, its limits need be emphasized. First, modern agriculture is characterized by great technological dynamism. Technologies become obsolete at an increasing fast rate. Indigenous practices will be replaced by more improved techniques. This is inevitable and must be encouraged. There are then two reasons why need has been stressed on indigenous knowledge. First, it is a logical starting point, and second, this knowledge must be preserved for posterity even as it dies.

Second, it must be recognized that these offer only marginal improvement opportunities and would certainly be inadequate in meeting our needs. No amount of funding will alter this fact. So, we must focus strongly on new inputs and technologies. It will be a mistake to deviate from this path.

Finally, we should note that all indigenous technologies are not sustainable. The slash and burn technology, cultivation of eroded and marginal lands are some of the examples. We must be aware of these limits as we blow the trumpet. To rectify a deficiency in our knowledge system is one thing, to go overboard on this could be disastrous.