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Innovative Approaches in Technology Dissemination: Experiences of ATMA Model in Bihar

K.M. Singh[1] and A.K. Jha[2]

Introduction

The inevitable changes in extension methodologies and approaches are primarily due to complexities arising out of globalization, liberalization and privatization. Past experiences of different extension approaches have been quite mixed. There are numerous success stories but evidences of failure are also plentiful. The weaknesses and failure of earlier extension approaches like Grow More food (GMF), Community Development Programmes (CDP), National Extension Service (NES), Intensive Agricultural District Programme (IADP), etc forced Indian extension system to undergo a series of organizational and operational changes.

The T&V system

One of the major changes in the area of 'Indian Agricultural Extension System' was introduction of Training and Visit system–popularly known as T&V system. It helped India to sail successfully through the turbulent sea of famine and food deficit prevalent during mid of twentieth century. The T&V Extension system, introduced in 1974-75, had many good features and it gradually replaced the CDP's multi-purpose approach by its single-line of command extension system and played a commendable role in augmenting the production of major food grains for achieving the national food security. T&V Extension System was effective in disseminating Green Revolution technology in the high potential irrigated areas, but it was blamed for inducing regional disparities as it failed to generate similar impacts on the productivity and incomes among farmers in rainfed areas. There were other systemic problems also, which became apparent by early 1990's. By the 1990s, the line departments primarily focused on the distribution of centrally funded subsidies and inputs. This situation had the following effect:

- Line department staff became increasingly *accountable to government*, rather than to farmers;
- Since government was partially involved in input supply, the government field staff viewed private input supply dealers more as *competitors* than as partners;
- Given this focus on central government schemes, there was less need for extension to work closely with researchers, resulting in *weakening research-extension linkages*.

Finally, with the exception of donor sponsored schemes, extension gave very little attention to *organizing farmers into groups* and, thereby, empowering farmers.

Need for a Decentralized Model

The main extension system primarily responsible for delivery and dissemination of technical messages is operated by the State Departments of Agriculture (DOA), through the state, district and block level machinery. Other state governments departments, such as Animal Husbandry, Horticulture, Soil and Water Conservation, and Fishery have been providing very limited extension services. The system however is more pre-occupied with implementation of

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a number of central and state sector schemes having input/subsidy delivery. The performance of the main extension system has been adversely affected by the difficulty in recruiting and retaining extension staff due to budgetary constraints, depleting operational support and inadequate technical background of the majority of the staff commensurate to the changing scenario of agriculture, resulting in the dependence of farmers on input dealers and others, as sources of information. Their role in technology up-scaling has been minimal and even non-existing.

Diversified nature of farming demands, against a background of the economic liberalization and globalization, is radically changing the spectrum of service providers to the farmers. Indeed, the private sector, farmers' organizations, cooperatives, self-help groups, Para-professionals, non-governmental organizations, input suppliers and small agri-businesses are increasingly engaged in providing information and services. Increased reliance on private sector extension does not imply a complete withdrawal of the public sector, which must continue to finance public goods extension and information services and coordinate extension activities.

During the mid-1990s, the Government of India and the World Bank began exploring new approaches to extension that would address these system problems and constraints. The result was a new, decentralized extension approach, which would focus more directly on agricultural diversification and increasing farm income and rural employment. The central institutional innovation that emerged to address these system problems was the Agricultural Technology Management Agency or "ATMA" model that was introduced at the district level to:

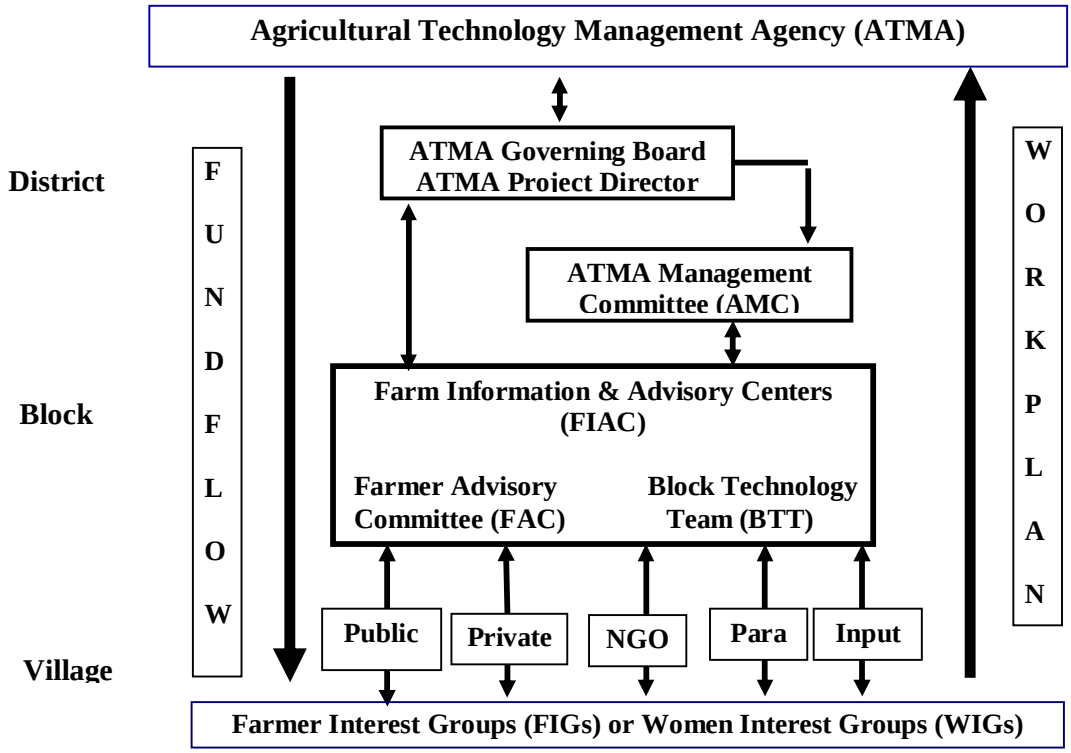
1. Integrate extension programs across the line departments (i.e., more of a farming systems approach),
2. Link research and extension activities within each district, and
3. Decentralize decision-making through "bottom-up" planning procedures that would directly involve farmers and the private sector in planning and implementing extension programs at the block and district-levels.

The ATMA Model

The Agricultural Technology Management Agency (ATMA) is an autonomous organization registered under the "Societies Registration Act of 1860" that has considerable operational flexibility. For example, it can receive and dispense government funds, enter into contracts, maintain revolving funds, collect fees and charge for services. In addition, it operates under the direction and guidance of a Governing Board (GB) that determines program priorities and assesses program impacts.

The head of each ATMA, known as the Project Director or PD reports directly to the GB, he also serves as chair of the ATMA Management Committee (AMC), which includes the heads of all line departments and the heads of research organizations within the district, including the Krishi Vigyan Kendra (KVK) and Zonal Research Station (ZRS). As each district now has a KVK; therefore, this multidisciplinary KVK plays a critical role in both on-farm research and training farmers in new production and value-added processing technologies. However, it is the PD that helps coordinate and integrate all agricultural research and extension activities carried out within the district. The organizational structure of the ATMA model is shown in Figure 1.

Figure 1: Organizational Structure of ATMA



ATMA Governing Board (AGB) sets program priorities and provides guidance as to how research and extension programs are implemented within the district. The composition of the AGB provides an equal balance between the heads of the line departments and research units within the districts, and the stakeholder representatives, and a cross-section of farmers, including women and disadvantaged groups, and private sector firms within the district. AGB is chaired by the District Magistrate who is the highest ranking government official within the district; the ATMA PD serves as Member Secretary.

ATMA Management Committee (AMC) serves as the Secretariat of the AGB headed by ATMA PD, helps coordinate and integrate research and extension activities within the district. Program requests come from each block and the AMC scrutinizes these requests on the basis of technical, financial and management criteria. The AMC then sends these requests to the GB for review and final approval.

ATMA Personnel, staff assigned to ATMA's headquarters is very small, so this organization does not become another government agency. They include the PD, a deputy project director (DPD), an accountant, computer operator, secretary, and a watchman. With the exception of the PD and DPD, all the staff is hired on a contract basis, so they do not become government employees. In general, PDs who are appointed from the SAUs function more effectively, since they are more open to new ideas, have a broader vision and are less bureaucratic in their approach to the job.

Farm Information and Advisory Centers (FIACs) established at the block-level in each project district with NATP funding have small, block-level facilities including an office for

the Convener of the Block Technology Team (BTT), a meeting room and office space for a computer with Internet connectivity. FIAC has become the physical platform by which farmers, the private sector and extension field staff from each line department could come together, discuss and plan extension program, and then work together in the execution of these programs. By design, the FIAC has become the single-window delivery mechanism for extension programs within the block. Also, the provision of Internet access served as an important resource for all participants.

Block Technology Teams (BTTs) include technical officers from the Departments of Agriculture, Horticulture, Plant Protection, Soil Conservation, Animal Husbandry (including Veterinary Service), Fisheries, Sericulture, Cooperatives and Marketing. The senior most officer within the block serves as the head or convener of the BTT. The role of the BTT is to develop a comprehensive extension program (called a Block Action Plan) that is consistent with farmer needs. The net effect is to improve extension program coordination and delivery at the block level, since program responsibility and accountability had been delegated to the BTTs and FACs.

Farmer Advisory Committees (FACs) composed entirely of farmers who represent different socio-economic categories of farmers within the block. The role of the FAC is to advise the BTTs on extension priorities for the block. In addition, the FAC reviews and approves the annual block action plans (BAPs) prepared by the BTTs. It also monitors and provides feedback to the BTT on BAP implementation. Another important function is to organize FIGs in other villages in their area.

Farmer Interest Groups (FIGs) in pursuing market-driven approach to extension, it is essential to get farmers organized around specific crops or products where there was market demand and that were appropriate to the agro-ecological conditions and resources of different farmer groups. In addition, to successfully supply different markets, it was essential to get these groups organized to achieve economies of scale and to create an efficient supply chain. These FIGs can then be organized along crop or product lines as block-level farmer associations (FAs) and district-level Farm Federations (FFs).

In ATMA model, with a view to ensure sustainability of extension services, a minimum 10 percent contribution has been mandated from beneficiaries in all beneficiary oriented activities like participation in trainings, exposure visits and demonstrations. However, so far public sector has not moved towards large scale commercialization of extension services.

Impact of ATMA model in Bihar

In Bihar, the role of ATMA has been extremely impressive, concerted efforts by the dedicated team of scientists and practice of demand driven approach made Bihar's ATMA one of the role models in the country. Participation of farmers in Governing Body (GB), ATMA Management Committee (AMC) at district level, and Block Technology Team (BTT) at block level brought the line departments together for planning, implementation/delivery, review and reporting the extension activities in an integrated manner are some of the unique features that give it an edge over the earlier models.

Farmers Advisory Committee (FAC) provided feedback to the BTT and highlighted various problems faced by the farming community. In addition to giving feedback on action plans prepared by extension officials, farmers have also been raising different issues of wider relevance. Thus, farmers played an important role in setting extension priorities of the

district. With accountability to solve farmers' problems and in-built operational flexibility, ATMA made suitable interventions**.**

Methodology

Final impact assessment included both the process and outcome of the project on the crop yields and farmers' income, etc. assessment of impact on the technology dissemination system and processes was conducted over the period of three years (from 2002 to 2004) by IIM, Lucknow along with routine monitoring & evaluation at different levels, i.e., state, district, block and village levels. In addition, special field visits were made to revisit the data collected by the IIM, Lucknow so as to have a comprehensive and terminal assessment of the functioning of the new institutional arrangements being pilot tested in the project districts. Further, in order to provide reflections upon 'with project' and 'without project' situations inclusion of out-of-project area farmers in the sample was necessary, and accordingly sample farmers from control districts were also covered under the study. The baseline taken for the study was the same as done by IIM, Lucknow during the period of June-July 2002, which was more on recall basis with reference to the pre-project crop year. Reference crop year for baseline survey, therefore, varied from district to district depending upon the year of project launch. The impact survey by IIM, Lucknow was conducted during the period June-July 2004, with reference to crop year 2003-04, however during revisiting for the current study, data was also recorded for crop year 2005-06 from the same set of sample villages and farmers.

The study was conducted through pre-tested semi-structured interview schedule keeping in mind the final output and outcome/impact indicators. The units of data collection included selected households as well as community organizations (FIG and SHG, etc.). Sample units were selected through multi-stage stratified random sampling method. Adequate number of sample households representing different farm-size classes was selected from each region. In order to have a comparative picture of temporal changes in non-project areas vis-à-vis project area, a set of households from non-project district were also selected (table-1). For comparison, three villages equidistant from three circles/clusters of equal distance from non-project districts were selected randomly as control. From each of the project districts 9 representative villages (3 villages from each of the three equidistant blocks) and 15 farmers (from each selected villages) representing different land holding classes were selected randomly. Similarly, 15 sample farmers from each selected villages from non-project district, representing different farm-size classes were selected as control. Total sample size was 540 (405 from project districts and 135 from non-project districts)

Table- 1: Number of selected districts, blocks, villages and farmers in different districts

Particulars	**Project district**	**Non-project district (Control)**	**Total**
Districts	1	1	2
Blocks	3	1	4
Villages	9	3	12
Farmers	405	135	540

Results and Discussion

Impact of the project

The main focus of the ATMA was to improve the existing process of technology dissemination system, through creation of various new institutions and strengthening the existing ones. It was expected that flexibility in systems would respond positively in facilitating the introduction of new crops/ enterprises, enhancement in yield and income as the intermediate output. This exercise needs to be broadened by including issues relating to overall developments such as NRM, Rural Development, Post-Harvest Technology and Marketing issues. Interventions undertaken by ATMA have resulted in multifarious outcomes, ultimately leading to greater impact even during a short span of time.

The impact could be perceived from various angles such as strategic planning, changing the mindset of people with coordinated/ integrated community approach, operational changes with flexible decision making system, use of IT tools and media, strengthening of institutional linkages specifically for research and extension, effective coordination between all stakeholders, focus on gender issues, bringing in eco-friendly outputs and helping to address poverty in the rural areas. Final outcome was observed in the improvement of quality of life and empowerment of farming community, including women leading to the sustainability of the approach/ system and equity. The project has been quite successful and effective in creating several institutions for strengthening the process of both development and dissemination of new/ improved technologies. This has been quite effective in facilitating the identification of real constraints faced by the farmers and adoption of new technologies/ farm practices, new enterprises, etc. promoted by the project. The information technologies have also started playing effective role and farmer-led extension has empowered farming community, including women. The time-lag in adoption of new technologies has considerably reduced and weaker sections of the society also have benefited from this process strengthening. It is obvious from table 2 that after the introduction of ATMA, average household income improved considerably. As compared to the baseline data of 2002, the actual income gain was about 12.3 percent in 2006. The income gain in non-project districts was just 10.6 percent. In absolute terms, per household annual income in the project districts increased by about Rs10, 000 from Rs 89049 in 2002 to Rs99423 in 2006.

Table 2- Performance Indicators of the Project

Unit: Rs./household/year

S.No.	Indicators	Baseline (2002)	Actual (2006)
1	Absolute Income Gain in Project Districts	61256	68797
2	Absolute Income Gain in Non-Project Districts	60512	66951
3	Net Gain in Household Income in Project Districts household Over Non Project Districts household	744	1846
4	Per Household Annual Income a. Project Districts b. Non-Project Districts	 89049 93542	 99423 85331

Source: AMC, IIM, Lucknow, 2004 and K.M.Singh 2006

One of the significant contributions of ATMA is creation of awareness, capacity and development of skills about the modern production technologies. Poor adoption of improved

technologies and week participation of farmers in transfer of technology programmes were identified as few of the bottlenecks in the success of past extension models. However, it was observed that, with ATMA's interventions there was a significant change in the rate of participation in the technology dissemination programmes and adoption of technologies. It emanates from table 3 that during the pilot test of project in Bihar, 5000 farmers were trained of which 80 percent small, 74 percent medium and 82 percent large farmers went for adoption of one or other improved technologies.

Table -3: Adoption Ratio of ATMA Field Programme-Training Activities

Targeted farmers	**Number of targeted farmers**	**Adoption ratio (Percent of targeted farmers)**
a. Small Farmers	2500	80
b. Medium Farmers	1500	74
c. Large Farmers	1000	82
d. Overall	5000	79

Actual adoptions of various technologies are presented in table 4. ATMA also promoted various types of conservation technologies like Integrated plant management (IPM), integrated nutrient management (INM), natural resource management (NRM); high value agricultural practices like horticultural and medicinal plant cultivation, horticultural production, fisheries, bee keeping dairying and vegetable cultivation; and the new enterprises in existing farming system were introduced in the project districts, which were adopted by the farmers at varying adoption rates. Since no baseline data for these interventions were available, comparisons of these were not possible. However, table 4 provides a fair picture of adoption and acceptance of new technologies among the farmers. Further, it is also obvious that although there was a marginal difference between the cropping intensities of the project and non-project districts, the farmers in project districts could realize 13 percent increase in the yield of crop along with an increase of farm income of 14 percent due to the adoption of new technologies.

Table-4: Percent Farmers Adopting New Technologies and Practices in Project Districts (in Percent)

S.No	New Technology	**Actual adoption (2006)**
1	IPM/INM/NRM	24.03 to 34.23
2	HMAPS Cultivation	0.1 to 0.7
3	Horticulture	28.9 to 29.4
4	Fishery,	0 to 3.5
5	Bee Keeping	0 to 0.7
6	Dairy	9.6 to 15.6
7	Vegetables	26.2 to 28.9
8	Inclusion of new enterprises in existing farming system in project districts.	25 to 43.3
9	Cropping intensity a. Project Districts b. Non-Project Districts	 196 194
10	Benefits of adopting new technologies - Increase in crop yield (%) - Increase in farm income (%)	 13 14

All this could happen because of improved research-extension-farmer linkage (REF linkage). ATMA's efforts to revitalize and re-establish the REF linkage improved the interaction among various stakeholders. It encouraged the movement of farmers to different research-extension bodies and also facilitated the flow of information from these bodies by ensuring their visits to the farmers (Table 5). It emanates from the table 5 that there were substantial increase in the frequencies of visits by the farmers and the extension-workers/scientists.

It also emanates from the table 5 that out of 100 visits by the farmers, 50 visits were made to contact block-level officers like Block Agricultural Officer (BAO)/ Block Extension Officers (BEOs), an increase by more than 36 percentage points over baseline period, 2002. It is important to take into account that farmers do not depend on a single source of information and often explore multiple sources to extract different information. Other trusted sources in order of importance were village-level workers (VLWs), agri-business enterprises, district-level officers (DAO)/ district extension officers, respectively. NGOs are also emerging as an important link in extension programmes. Almost similar pattern was observed in the visits of extension officers and scientists to the farmers. About 51 percent block –level officers visited the farmers to perform different extension related activities. Scientists of Zonal Research Centres and Krishi Vigyan Kendras and the village level workers contribute in the same proportion by making visits to farmers to disseminate technologies and technical know-how..

Table-5: Indicators for Improved Research-Extension-Farmer linkages

Unit: Percent

Sl. No.		**Baseline* (2002)**	**Actual* (2006)**
A.	**Farmer's visit to extension officers and scientists**		
1	Village level workers	10.28	28.72
2	Block level officers	13.82	50.35
3	District level officers	3.90	26.95
4	NGOs	0	6.38
5	Agri-business enterprises	11.70	29.43
B.	**Visit of extension officers and scientists to farmers**		
6	Scientists of ZRS/KVK	10.28	31.20
1	Village level workers	8.10	31.56
2	Block level officers	12.05	51.06
3	District level officers	3.50	30.14
4	NGOs	0	7.09
5	Agri-business enterprises	1.77	26.95
6	Scientists of ZRS/KVK	5.31	23.04

*The figures are mutually inclusive
Source: AMC, IIM, Lucknow, 2004 and K.M.Singh 2006

ATMA has also played an important role in empowerment of rural women by imparting trainings for enhancing their skills and technical capabilities. To do so, 418 trainings were organized by the ATMA personnel to train more than 13.5 thousand women in various relevant areas like cultivation of high-value crops (vegetables, mushroom, medicinal and aromatic plants, etc.), modern technologies of dairy farming, small-scale value addition e.g. sattu making, (floor of roasted chickpea, cereals, etc.), mother & child care, etc.

Besides, 411 women self-help groups in 148 villages distributed across the state/ district were formed to empower the farm women and address the issues of scale of production, capital, marketing, etc. Today, many of these SHGs/WIGs are being successfully run and organized by the women.

Table-6: Gender related issues addressed by ATMAs (1998-2006)

Number

Sl. No.	**Sensitization of Women**	**Actual (2006)**
1	Trainings for women's technological empowerment	418
2	Number of women trained	13555
3	Women Self Help Groups (SHGs) formed	411
4	Villages covered	148

Source: K.M.Singh 2006

Process Improvements attributed to ATMA Model in Bihar

Demand-Driven Extension

Participation of farmers in GB, AMC and FAC provided them an opportunity to highlight various problems facing the farming community. In addition to giving feedback on action plans prepared by extension officials, farmers have also been raising different issues of wider relevance. Thus, farmers played an important role in setting extension priorities of the district. With accountability to solve farmers' problems and in-built operational flexibility, ATMA made suitable interventions**.**

Bottom up Planning

The traditional top-down approach of planning has been reversed and now planning process has started from the lower level. Strategic Research and Extension Plan (SREP), which was prepared at district level after identification of technological gaps through participatory field assessment was introduced for the first time.

Integrated Technology Transfer System

It was observed that the multi-point disjointed system was replaced by an integrated technology transfer system and has started working in planning, extension and review of extension activities. The ATMA, Governing Board (GB) provided robust integrating–mechanism for proper decision-making, guidance, review and control towards integrated delivery of services. After integrated/holistic (with respect to farming system) planning line departments took up implementation of various selected activities individually under the coordination of AMC and BTT.

Broad Based Extension System

A good beginning has been made and now the system is planning its activities for field crops, tree crops, animal husbandry, fisheries, etc in integrated manner at common crops, tree crops, animal husbandry, fisheries, etc in an integrated manner at common platforms. Efforts were made to introduce less attended crops such as coarse cereals and minor horticulture crops into the farming system.

Mobilization of Communities

ATMA have adopted two pronged approach towards farmers/ community mobilization on one hand new farmers groups were organized and on the other existing groups were identified

and oriented with the ATMA system. This has helped the farmers providing them easy access to new technologies, collective procurement of inputs as per their needs and disposal of their produce at a better negotiable price than the practice in past i.e. individual approach.

Decentralized Decision Making

Apart from reversing the planning process (from top-down to bottom-up) decision-making has also been decentralized to a great extent. After approval of the Annual Action Plan of ATMA the funds were directly released to the ATMA from Govt. of India. ATMA office in turn releases project funds directly to the Officer In-Charge of Block Technology Team against the GB-approved Block Action Plans. Such mechanism of keeping the state government and district heads of line departments out of fund flow channel (for field program component) has proved quite useful.

Convergence of programmes

The process of dovetailing has already begun whereas convergence would require policy decisions by government. In addition to integrated planning and implementation of extension interventions, ATMA tried to undertake dovetailing of their activities with schemes of line departments with some successes.

Market-Led Extension

With the globalization of market, farmers have to transform themselves from mere producers-cum-sellers in the domestic market to organized market driven production as per consumer demand to realize the better returns on investments, risks and efforts. Market-led-extension system establishes its position by helping the farmers realize high returns for the produce and minimize the production cost and improve the product value as marketability.

Public- Private Partnership

In the wake of increasing involvement of private sector in agricultural extension Public-Private Partnership in various modes / forms can provide synergistic approach in the extension efforts. Public-Private Partnership has emerged as one of the crucial areas in agricultural extension by ATMA's in Bihar and it was found quite successful.

Partnership for Sustainability

Some ATMAs also charged a small fee for rendering their services in form of transfer of technology, training, exposure visits, and membership of FIG/WIG etc. This showed the acceptability of ATMA concept among the farming community and also change in the mindset of the farmers from subsidy oriented extension services to cost sharing for these services.

Farmer-To-Farmer Extension

Project experiences indicate that farmer-to-farmer extension is quite efficient (cost-effective) and effective (leading to good adoption). Majority of ATMA have developed a pool of Farmer Resource Persons who are by and large FIG/WIG leaders, extending technical know-how to farmers/ farmwomen in their area of expertise.

Impact of ICT Interventions

The most visible impact of ICT interventions under ITD component of NATP has been the increased awareness and technical capacity building of ATMA and FIAC staff and officers. The ICT capacity building has also helped the ATMA staff to develop different matrices for collation and submission of monthly, quarterly, annual reports/ returns, reimbursement

claims, office accounting, documenting the project achievements and also share their successes across the state and so also at national level.

Gender sensitization
Women participation in agriculture has been well recognized by all the development agencies. Accordingly, due importance was given at every level. Women were involved in decision-making system right from the level of GB to FAC.

Environmental issues
Majority of the ATMA have promoted eco-friendly technologies namely use of Integrated Pest Management (IPM) by promoting bio-pesticides and neem cake, Integrated Nutrient Management (INM) by use of green manuring, improved soil and water conservation practices, by changing the cropping patterns and organic farming, promoting the use of Vermi-composting.

Poverty alleviation
The project has contributed in generating additional employment opportunities by creating a number of enterprises at village level through diversification, intensification, post-harvest opportunities, processing and marketing.

Operational difficulties faced by ATMAs
ATMA is currently facing numerous implementation challenges. Four issues have been critical:

- Insufficient support: The same technical support and funding available during the pilot stage is not available at the expansion phase.
- Mismatch with diversity of application contexts: The uniform model is struggling to cope with the wide diversity in Indian agriculture in terms of different crops, livestock, rural enterprises, infrastructure, governance, local institutions and ethnic groups, social and economic status of farmers.
- Lack of local ownership: Since the model was centrally conceived and promoted it suffers from lack of ownership and is treated as just one more central scheme that state level extension services have to implement.
- Capacity and institutional constraints: Lack of dedicated manpower, functional autonomy and attitudinal barriers at all levels.

Conclusions
The move from a policy of *food security* to a strategy that focuses on *agricultural diversification* aimed at increasing farm income and rural employment carries with it implicit risks for the small-scale farm households that are expected to benefit from this approach. ATMA model which was introduced to replace T&V to over come some of its weaknesses has been quite successful and for the first time, an attempt for convergence of extension by different service providers has been attempted through a legally-constituted body. In addition, ATMA's have developed a mechanism for participation of farmers in deciding priorities (through Strategic Research and Extension Plan), identifying and implementation programmes (through Farmer Advisory Committees-FAC's). This has brought some additional funding for implementing demonstrations, trainings, exposure visits, and forming farmer groups and the groups are now facilitated in developing better links with agro-processors. Further, ATMA's brought some publicity and goodwill and also generated some success stories for extension at a time when public funding and support for extension has been dwindling. They also provided space for seeding some new ideas such as public-private

partnerships and user contribution for extension, though several challenges still remain in mainstreaming these ideas

However, ATMA director and other agricultural leaders within each district need to continually assess their comparative and competitive advantage in producing different high-value crops and products. The most critical output of this strategy will be that the current generation of farmers will learn new technical, management and organizational skills that will be passed on to the next generation as they seek employment outside of production agriculture.

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