

# India and FAO

## Achievements and success stories

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## Introduction

### We have come a long way — a journey from 1980 to 2010

India has come a long way since 1945 when it became one of the founding members of FAO as a low-income food-deficient country. Today the country is not only self-sufficient in rice and wheat, it also exports a range of food products and at any given time has up to 60 million tonnes of food grain buffer stocks! In this journey of success, FAO has been a staunch partner since 1948, when FAO operations in India first began.

In a country as large as India it is inevitable that the investment by FAO, in money terms, is small compared to the investment of the Government of India in agricultural development. Although the dollar-value of the assistance may be small, in terms of technical inputs, FAO has made a significant contribution. In the words of M.S. Swaminathan, father of India's green revolution, "FAO has played a catalytic role in India's progress in the areas of crop and animal production and food security." With its global experience, FAO has provided key policy and technical inputs in a range of areas involving the food and farm sectors. It has contributed greatly to the Indian success story.

From 130 million tonnes in 1980, India's food grain production has risen to over 240 million tonnes in 2010. With Operation Flood, milk production rose to 113 million tonnes from about 35 million tonnes in 1980, also making it one of the largest employers of rural people, especially women. Fish production has also grown substantially. Employing over 15 million people, India is now a major fish exporter. Development of water resources for irrigation has underpinned crop production. However, water scarcity and falling water tables have been a key concern in recent years. On the positive side, this has led to awareness that water is an exhaustible resource. As a result, the importance of judicious use of water is being increasingly recognized.

Over the years, the work of FAO in India has gone well beyond the realm of food production, covering issues like access to food and nutrition, livelihoods, rural development and sustainable agriculture. With the looming impact of climate change and outbreaks of new strains of pests the work of FAO has become even more complex, making it an important knowledge partner to assist the country with informed decision-making. At the same time, India is also an important knowledge partner of FAO, providing technical expertise to other countries, and it acts as an important source of development lessons.

## 1. Analytical summary

### Analysis – an evolving and holistic partnership

The close partnership between FAO and India has evolved over time to absorb the changing complexities of Indian and global agricultural systems. FAO has moved from being an implementer of development projects to a facilitator and knowledge partner, adding value to existing technologies and approaches. From looking strictly at agricultural output, FAO has helped India take the holistic “seed to plate” approach. Issues like livelihoods and access to food by poorer communities, sustainability of water and natural resources and soil health have come to occupy centre stage.

India-FAO cooperation has covered multi-lateral issues such as developing food standards, guidelines and codes of practice under the Codex Alimentarius Commission. The cooperation also seeks to protect against animal and plant diseases and pests and food safety threats under FAO’s Emergency Prevention System — *EMPRES*. India specific matters have been addressed through national development initiatives, participation in regional and global programmes and FAO’s normative products. A major part of the work under the partnership has been concentrated on water and natural resource management, followed by crops and livestock, food security information systems and fisheries.

Knowledge in issues relevant to agriculture in a globalised environment has been keenly sought by India for both domestic and export markets. FAO has shared its considerable experience from other countries on food safety standards and agricultural trade.

The success of the National Dairy Development Board (NDDB) in expanding milk cooperatives and bringing greater income to households with one or two cows is a celebrated success story better known as the White Revolution. FAO collaborated with the NDDB to provide technical assistance in milk production and processing. FAO has also provided support on transboundary animal and plant health issues to protect agricultural production systems at the farm level. FAO support has also helped at the government level through improved quarantine

practices. The *Integrated Pest Management* approach has been mainstreamed into Indian agriculture policy and has proved to be effective in reducing agro-chemical use while simultaneously preventing major crop failures due to pests and disease. Regional initiatives helped India develop networks on technical matters and to strengthen its border surveillance and control systems.

Water and natural resource management has taken the lion’s share of FAO’s expertise and financial resources. Some of its water related work had far reaching effects, inviting global interest in the *Andhra Pradesh Farmer-managed Groundwater System* project, better known as *APFAMGS*. The project was path-breaking in empowering small farmers to understand, manage and maintain groundwater resources as a common property. A subsequent follow-up to the project is building capacities of the farmers to understand and cope with the impact of climate change.

Similarly the *Mapping System and Services for Canal Operation techniques* or *MASSCOTE*, a new approach to modernizing irrigation systems and its management, was adopted in Karnataka and Uttar Pradesh. It holds potential for wider application to river-basin management in India.

FAO activities in the fisheries sector have furthered the policy goals of the Government of India (GoI) by addressing sustainability and inclusiveness needs in the sector. Technical interventions introduced to streamline fisheries management have not only improved production, they have also improved the livelihood of millions of poor people who depend on fish for a living.

FAO looks to India as a ‘think-tank country’ to produce innovative ideas, which FAO mainstreams into its normative products. This collaboration now extends to the private sector.

#### 1.1. Dairy

In 2010 India’s milk production crossed the 110 million tonnes mark, meaning that India had more than trebled its production in the last three decades. Over this period, annual demand for milk had grown from 38 kilograms (kg) to 65 kg per capita. India’s *White Revolution* — backed by thousands of rural milk cooperatives covering

80 000 villages and over 10 million farmers — is one of India's most celebrated success stories in development. The dairy sector sustains tens of thousands of farm families and provides nutrition, draught power, and manure for agriculture. The turnover of the dairy sector, around US\$29 billion, almost equals the combined value of paddy and wheat produced.



Growth in India's formal dairy industry was first spurred by high demand from metro cities and the cooperative movement was driven by the desire of farmers to maximize financial rewards from their work. The impetus for growth was supplemented in the early 70s when automatic bulk milk vending machines gave birth to *Mother Dairy*. The cooperative dairy movement and Operation Flood based on the 'Anand model' gave rise to the White Revolution spearheaded by the National Dairy Development Board (NDDB). It not only laid the foundation of self-sufficiency in milk but also played a key role in giving supplementary incomes to the rural poor.

In 1991 the dairy sector was de-licensed, and by 1999-2000 India's dairy industry was employing some 5.5 percent of the country's entire workforce. More importantly, the dairy sector is a key driver of the rural economy. India is home to a fifth of the world's bovine population, largely found in the backyards of rural homesteads. Some 75 percent of rural Indian households have 2 to 4 cows or buffalo on average, serving as a partial source of livelihood. The sector provides for about a third of Indian rural incomes and drives rural nutrition, employment and women's empowerment.

Since the early 1970s and with UNDP funding totalling more than \$10 million, FAO implemented four projects in direct support to dairy development, besides other projects supporting related sectors such as promoting green fodder, animal health and production, and pro poor livestock development.

## 1.2. Food crops

India has quadrupled its food grain production since independence in 1947 and over the last three decades food grain production rose from 130 million tonnes to 240 million tonnes. Against this background of success, there have been periods when the rate of growth in food grain production gave cause for concern. Most recently this was in the period 1995-2005, when the growth in food grain output slumped. This was attributed to a decline in public spending and the *Eleventh Five Year Plan* corrected this. However, food grain production is still strongly influenced by the annual monsoon and there are concerns on the likely negative impact of climate change. Given its current population growth rate, India will need to double its food grain production by 2050, which means growing another 5 million tonnes annually.

Past main inputs provided by FAO relate to research, education and training. Examples of technology transfer and capacity building are the FAO/UNDP support in bringing hybrid rice technology to India, and FAO support to oilseeds and pulses. More recently, FAO's assistance is geared to transboundary pests and disease, climate change, and agribusiness development,

## 1.3. Water

India's water resources, particularly in the context of agriculture, are facing extreme stress. The country sustains 16 percent of the world's human population and 20 percent livestock population with just 3 percent of the world's water. With changing lifestyles and rising water consumption in urban areas, water for agriculture is under threat from other users. Conflicts over access and control of water sources are becoming common, not only among people, but also among states within the country.

In the past, over 10 FAO assisted projects with a total value of well over \$15 million have focussed on water-

related technologies and groundwater management as well as – increasingly – efficient irrigation management. Noting that by 2050, when India will need to double to its food grain production, conservation of water sources and judicious use of water will be key to sustaining agricultural production in the coming years. This growing realization over the past decade has served to increase the level of FAO activity on water.

## 1.4 Fisheries

Over the last 30 years, there have been major changes in the scale and nature of the fisheries sector in India. From an industry based on small-scale artisanal production it now combines traditional techniques with a range of new technologies serving a vastly increased range of markets. India is the eighth largest fish producer in the world with an output of over 6.5 million tonnes per year. The share of inland fisheries has steadily increased, now comprising around 60 percent of total production. Much

of this growth has come from the expanding aquaculture sector.

Over 15 million people — 3.5 million in marine fishing — are engaged in the industry, with fishing serving as one among a series of livelihood strategies for small fishers. Fish and fish products have come to occupy an important place in the export market, largely as a result of prawn farming that feeds export markets. Indian exports are estimated to comprise around 6 percent of the global trade in fish products, valued at over US\$1.5 billion. India's *11<sup>th</sup> Five Year Plan (FYP)* lays stress on the importance of increasing sustainable production, particularly through improved deep-sea fishing and investing in inland fisheries.

Besides the regional fisheries flagship *Bay of Bengal Programme* based in India, direct FAO support to fishery development of India has surpassed \$18 million over the last 30 years through a wide range of national projects.



## 2. Selected successful FAO programmes

### 2.1 Dairy — bringing far reaching benefits

**F**AO has been a partner in India's dairy-cooperative movement right from the early 70s along with UNDP. FAO provided technical assistance to NDDDB on various aspects of efficient milk production and preservation like chilling units, pasteurising and packaging. The technical assistance also extended to on-farm production enhancement through provision of animal feed, breeding and veterinary services. Farmers were also given technical support for techniques in artificial insemination.

FAO specialists in dairy engineering, processing, and animal production were assigned to NDDDB at regular intervals thereby building individual and institutional capacity. Several NDDDB scientists went on overseas training and study tours on subjects ranging from dairy development to embryo-transfer technologies gaining exposure to the frontiers of dairy technology. Some major projects associated with NDDDB include, *Stimulating milk marketing and dairy development* (1976-84, US\$2.7 million, UTF); *Operation Flood II – technical assistance* (1979-1995, US\$5 million, UTF); *Follow up of Operation Flood III* (1996-1999, US\$1.2 million, UTF). The cooperation with NDDDB spans over three decades and continues to this day.

The dairy industry in India is undergoing rapid changes catering to changing demands, and a diverse range of dairy products. Packaging and food safety are key components of the dairy industry. FAO, along with WHO, has worked with the NDDDB to provide key scientific advice, and raise awareness of risk-analysis principles for food safety authorities in the dairy sector. FAO has provided inputs to address the relatively poor per animal milk production in India of 1 000 kg/year in India versus a world average of 2 038 kg/year. This work focussed on the availability of green fodder, access to institutional credit and animal health facilities. It also looked at disease control and related technologies to improve production. To improve milk production by promoting green fodder, which represents 60 percent of the cost of production, FAO undertook the *Grassland and fodder development project* at Jhansi (1975-1980, US\$1.2 million).

Projects on animal health and production included the Rinderpest eradication campaign (1986-1991); Buffalo

development (1986); Biotechnology Network Animal Husbandry (1990-1992); and Conservation of Farm Animal Genetic Resources. Another major initiative in livestock health was the establishment of the *High security animal disease laboratory* at the Indian Veterinary Research Institute in at Izatnagar in Uttar Pradesh (1987-1994, US\$672 000).

Acknowledging the importance of livestock, particularly small ruminants, to the livelihoods and food security of the poor, FAO launched the global programme *pro poor livestock policy initiative (PPLPI)*. Funded by DFID, the 2001-2009 project aimed to reduce rural poverty through equitable, safe and clean livestock farming. In the context of India it is interesting to note that the *10<sup>th</sup> five year plan (FYP)* devoted a full chapter to animal husbandry and dairying, including small ruminants. *The 11<sup>th</sup> FYP* further emphasised the importance of livestock policy and infrastructure development.

In 2006, PPLPI gave birth to the *South Asia pro-poor livestock policy programme (SAPPLPP)* led by NDDDB and FAO (2006-2009, US\$1.5 million, NDDDB and UK). The programme created a space for learning and creation of knowledge, establishing good practices on common property resources, small ruminants and the backyard poultry sector. The good practices were an important capacity building exercise for NGOs in the area of livestock management and common resources to improve livelihoods of the poor. When the *PPLPI* project closed in 2009, the NDDDB, the Ford Foundation and International Fund for Agricultural Development (IFAD) came forward with a total of US\$1 million to enable *SAPPLPP* to continue. *SAPPLPP* has been a good example of partnership and its lessons could be applied more widely.

With NDDDB plans to create new generation cooperatives across India the dairy sector is poised for another major leap and FAO looks forward to a continued association with the NDDDB.

### 2.2. Food crops — beyond the green revolution

FAO has worked with the government to catalyse food grain production by responding to challenges in agricultural research, education and training and by bringing in new technologies. In the 1990's FAO-UNDP

assistance helped in bringing hybrid rice technology to India. By developing commercially viable rice hybrids the US\$1.5 million project was able to boost rice production by as much as 25 percent. Plant improvement using modern biotechnology at the Bose Institute in Kolkata (1986-1993) was another milestone in expanding knowledge on genetics and plant varieties.

FAO helped widen the knowledge base by establishing 28 centres of excellence in 23 agricultural universities over a period from 1973 to 1994. In addition, FAO helped bring hi-technology to boost India's Green Revolution in the form of the *Phytotron facility at the Indian Agricultural Research Institute* (1990-2002, US\$2.1 million). This facility made it possible to experiment with growing crops and plants under controlled climatic conditions. The research was a boon for improving the productivity of cereals, pulses, oilseeds and other crops.

FAO has also provided specialised technical assistance on individual crops. For example: raising the productivity and nutritive value of oilseeds and pulses in rain-fed areas; promoting the economically sustainable use of integrated pest management practices among farmers; conservation of plant genetic resources; and, providing long-term support for locust control in deserts. FAO has also provided support in areas like market planning and design for better distribution of perishable agricultural products such as vegetables and fruits; improvement of banana production and marketing for small-scale growers; and, developing the technical capacity to promote organic agriculture.

With globalisation, the role of FAO in the food grain sector has widened to include issues of international trade, food safety standards and trans-boundary pests and diseases. For instance, India annually earns of the order of US\$300 billion through food exports. However, with WTO norms in food quality and safety becoming increasingly more demanding, India finds itself constrained because of weaknesses in these areas. FAO has brought its global experience to assist India to fill technical gaps by helping establish the National Codex Alimentarius Committee. This has been critical in helping to ensure that India's food exports meet international food safety and quality standards. The ability to meet Codex standards has also had a ripple effect in raising

awareness of the need to strengthen standards in the domestic food market. Information from FAO's Codex website is widely used in India.

FAO has also been collaborating with the private sector in India to increase its understanding and share of the global food trade. It collaborated with the government and the Confederation of Indian Industry (CII) to organize two International Food Regulatory Summits held in 2007 and 2008. The summits created a platform, upon which the food industry, allied stakeholders and food regulators joined international counterparts to get a better understanding of evolving global food regulatory regimes. Both CII and FICCI (Federation of Indian Chambers of Commerce and Industry) expressed satisfaction that the events helped the Indian food industry get a better global perspective. A similar event, the First Global Forum on Agro-industries held in April 2008 was also co-sponsored by FAO and helped domestic participants in better understanding the dynamics of food exports.

A dimension of FAO's work that is increasingly valuable to India is the risk from trans-boundary plant pests and diseases. FAO has provided critical technical assistance in the establishment of plant quarantine systems at five ports. The quarantine stations at New Delhi, Mumbai, Kolkata, Chennai and Amritsar play a key role in screening seed, tuber and other plant for pest-free imports or exports. Similarly the project on *Capacity building in bio-safety of GM crops in Asia* (2002-2006, US\$1.12, Japan) has helped develop national capacity on issues of bio-safety risks of GM crops. The project also helped establish the Asian Bio-safety Network.

Climate change is a new area of focus for FAO and India. Climate change is frequently quoted in the media as cause of the climatic extremes that adversely affect food crops in India. Field trials at the Indian Agricultural Research Institute have shown that basmati, India's most famous export rice, may lose its fragrance and length due to temperature rise. This could place at risk the export of rice, which in 2010 was over 3 million tonnes of basmati and superior quality rice. M.S. Swaminathan, quoting FAO, warns that a 1 degree Celsius rise in mean temperature can translate into 6 million tonnes of lost wheat production in India.



To assess the impact of climate change on wheat, a high level technical mission brought together leading wheat and climate scientists from around the world to visit wheat-growing states in India in 2010. FAO also initiated a pilot project on climate change in Andhra Pradesh, which is transferring climate change knowledge to the community (2010-2012, US\$2.4 million, GEF and Netherlands). This will enable farmers to adapt their farming patterns and minimize the impact of climate change. By adapting the project to other agro-climatic zones the large-scale impact of climate change can be understood by farmers and they can develop mitigation strategies.

FAO continues to add to discussions on Bt cotton; training on Codex Alimentarius standards and assistance on food surveillance; collaboration with NREGA (National Rural Employment Guarantee Act) on watershed management; support to development of agribusiness and value chains, and pest and disease control.

### 2.3. Water — under stress

In earlier decades, work had been focussed on water-related technologies such as the *Development of low cost canal lining and compaction of embankment in Maharashtra* (1984-1987, US\$350 000); *Support to watershed management, planning and monitoring* (1980-1981, US\$210 000, TCP); *Rain-fed farming and watershed management* (1992, US\$75 000) and *Re-inventing irrigation and agricultural water governance in Asia-Pacific* (2010-12, US\$487 000, TCP). Whereas, FAO's more recent work approaches the challenges of water management from both a technical and social perspective. It recognises that solutions to complex issues such as water use and availability involve communities, technologies and government at all levels.

A seminal work in groundwater management was the *Andhra Pradesh farmer managed groundwater systems (APFAGMS)* project (2004-09, US\$6.8 million, Netherlands). The bottom up approach in this pilot project involved and empowered the community to understand and manage their scarce water resources. Taking a hydrological unit approach to groundwater management, the project helped the community to better understand and harness water as a common resource. The water-

scarce state of Rajasthan has shown keen interest in the project for possible replication. Several other stakeholders have visited the project site to study the benefits that have accrued to the farmers. *APFAGMS* has been much appreciated, not only in India, but also globally to empower farmers at the grassroots level.

Another good example of an integrated approach to water management was the *Andhra Pradesh water management project* (2004-2010, US\$4.7 million, Netherlands). The project aimed to improve water efficiency in irrigation and ensuring benefit to tail end users. Optimal use of rain, groundwater, canal and waste water was made to increase farm outputs by a combination of interventions like matching demand and supply; using water-saving rice varieties and draining sub-surface water into rehabilitation tanks. The project also reclaimed land that had become unproductive as a result of water logging or soil salinity. A crop-water-budget developed by the project showed farmers how to evaluate water productivity as a result of less water used, higher yield, and increase in cropping intensity. The Acharya N.G. Ranga Agricultural University (ANGRAU), which implemented the project greatly benefitted from the knowledge and skills its staff gained in participatory research and implementation.

The *Mapping System and Services for Canal Operation Techniques* or *MASSCOTE* (a normative product developed by NRL) is another major success story in efficient irrigation management. The pilot project in Karnataka, based on modern design and management concepts, has generated keen interest among farmers and irrigation experts alike. *MASSCOTE* design and application is now being keenly studied in several parts of India for possible replication. Uttar Pradesh and Andhra Pradesh have expressed interest in the approach. The *MASSCOTE* experience of efficient irrigation management has been shared with policy makers of the five Central Asian countries.

*Promotion of livelihoods improvements in dryland farming on the Deccan plateau* (2004-08, US\$3.2 million, Netherlands) was another project that helped increase productivity in arid conditions. The project was executed by the Agriculture Man Ecology Foundation (AMEF) in villages in Karnataka, Andhra Pradesh and Tamil Nadu.

Farmers benefitted using the LEISA or low external input sustainable agriculture technology that increased yields through low, but efficient, use of water.

Continuing the focus on management of scarce resources, FAO developed a project to extrapolate the lessons learned in groundwater management (under APFAGMS) to develop a similar approach to adapt to climate change in rain-fed agriculture. The project, funded by the Global Environment Facility, will use the farmer field school approach to educate communities on issues of climate change. It will also jointly develop approaches with farmers to adapt their farming practices to changing climatic conditions and remain productive and profitable.

A notable feature of the above-mentioned projects has been models for community participation and management; clearly depicting how equipping farmers with knowledge and decision making tools can help them cope with stressed conditions. FAO has served as a knowledge manager by not only bringing its global experience to India but by harnessing Indian experts to share their experience globally. In addition, FAO leads the joint UN Development Assistance Framework (UNDAF) Cluster on Water that takes a holistic approach to water development. An India water development report will serve as a guide on the way forward to use and manage water resources.



## 2.4 Fisheries — mainstreaming pro-poor approaches

FAO has had a major presence in Indian fisheries. Technological interventions introduced by FAO to

streamline management have not only improved fish production, they have also improved the livelihood of millions of poor fisher folk who depend on fish for a living. The participatory approach used by FAO, coupled with a focus on gender empowerment, has been mainstreamed into the fishery sector. FAO has literally been a life-saver of coastal fishers in Andhra Pradesh where one of its projects enabled installation of VHF shore-to-vessel communication systems. Part of a comprehensive community-based disaster preparedness plan, the project ensured that even in severe cyclones, the fishermen of Andhra Pradesh reach ashore safely.

*The Bay of Bengal Programme, or BoBP*, has been FAO's flagship programme, leaving an imprint on the entire fisheries sector far beyond the Bay of Bengal. The *BoBP* was instrumental in leading the mechanisation of traditional fishing craft and the introduction of new types of fishing gear. More importantly, it mirrored the participatory approach and gender-awareness that FAO brought to fisheries development and management. Based in Chennai, the *BoBP* ran for 22 years and attracted a wide range of development partners because of its path-breaking work. Highlights of the *BoBP* included revolutionising boat building techniques through the use of Glass Reinforced Plastic (GRP) in hull construction and widespread introduction of motorised small craft and mechanised larger craft.

The rising number of fishing units increased output from marine fisheries in the 1990s. Through training, fisheries professionals became more aware of social issues, and the importance of participation and community development. *BoBP* established formal and informal networks, which continue to thrive today. As a tribute to its utility, the programme continues to live as the *BoBP-Inter-Governmental Organization*, which enhances cooperation among member countries of the region and provides technical and management advisory services for sustainable coastal fisheries development.

Another major FAO involvement was in two community-managed projects following the tsunami of 2004. Most interventions were concerned with long-term recovery and rehabilitation issues in line with long-term policy objectives of the Government of India.

The first of these projects was a regional intervention based in Bangkok, covering all countries affected by the 2004 tsunami. The second was part of the India-focused United Nations Team for Tsunami Recovery Support (UNTRS) based in Chennai that was established in March 2005 and consisted of six UN organizations (2005-08, US\$1.8 million). Though UNTRS was wound down in December 2008, a successor project named *Fisheries management for sustainable livelihoods (FIMSUL)* (2009-10, US\$2.1 million, UTF), is being carried out by FAO. FIMSUL builds on fisheries management activities. Funded by the World Bank, this project will advance many of the ideas and pilot projects pioneered by FAO in fisheries management.

Within UNTRS, FAO worked with a range of partners including the Governments of Kerala and Tamil Nadu, government agencies such as MPEDA, NGOs, research institutions and private companies. It focused on three main areas:

1. Community based fisheries management developed forms of co-management, taking into account traditional forms of fisheries management in South India.
2. Fisheries livelihoods were enhanced and diversified through pilot projects on micro-finance, micro business, deep-sea tuna fishing and harbour management.
3. Fisheries livelihood diversification used rafts to reclaim agricultural land for the potential use of fishing households.

Several national and regional FAO projects have fed into India's rising fishery sector and include development of management tools in fish handling and production for the domestic and international markets. An example is the raising of shrimp quality in coastal areas as was evidenced in Andhra Pradesh where FAO carried out the



*Health management of shrimp aquaculture project* (2003-05, US\$374 000, TCP).

Similarly the project *Capacity building in support of cleaner harbours* (2006-09, US\$318 000, TCP) addressed issues of producing management models that reduce wastage, improve standards of hygiene and apply the principles of HACCP (Hazard Analysis and Critical Control Points). Similarly, another project *Strengthening national capacities in seafood trade policy including risk assessment and traceability* (2004-06, US\$383 000, TCP) helped India meet the changing trade demands under WTO rules.

FAO has developed pro-poor aquatic management strategies, which enable vulnerable groups to develop their own management strategies. An example was the *Poverty alleviation through improved aquatic resources management in the Asia-Pacific project* (2003-05, US\$345 000, TCP). FAO has also helped create systems and rules that include participation of fishermen as in the *Support to safety at sea for small-scale fisheries* project (2006-08, US\$568 000, Sweden). The *Bay of Bengal Large Marine Ecosystem* project (2009-14, US\$12 million, GEF) was a major step towards sustainable fishing through efforts to protect the health of the ecosystem in the Bay of Bengal.

## Success stories

### 1. India, the world's largest milk producer

India has become the world's number one milk producing country, with output in 1999-2000 forecasted at 78 million tonnes. India's annual milk production has more than trebled in the last 30 years, rising from 21 million tonnes in 1968 to an anticipated 80 million tonnes in 2001.

This rapid growth and modernization is largely credited to the contribution of dairy cooperatives, under the Operation Flood Project, assisted by many multi-lateral agencies, including the European Union, the World Bank, FAO and WFP.

In the Indian context of poverty and malnutrition, milk has a special role to play for its many nutritional advantages as well as providing supplementary income to some 70 million farmers in over 500 000 remote villages.

### 2. Farmers working together to manage water

*(Andhra Pradesh Farmers Managed Groundwater System or APFAGMS project)*

The idea of APFAGMS was first mooted when successive crop failures in India's arid Deccan plateau became recurring phenomena as groundwater tables kept falling year after year. Convinced that the problem could be mitigated, FAO hit upon the idea of working with farmers' collectives. The idea of APFAGMS was born.

It brought together over thirty thousand farmers from 638 villages in seven districts of Andhra Pradesh to tackle a common problem, drying up wells. The plan was to make farmers not only aware of their limited resources, but also to teach them how to conserve and manage the scarce water for optimum benefit. In the end, farmers in the project demonstrated how simple technologies and commonsense knowledge, when harnessed and implemented collectively, could transform bleak farmlands into lush green fields.

The first strategy was to get farmers on board to discuss issues related to groundwater distress, and challenge them to look for local solutions. Water was not seen from a local individual or village perspective but a comprehensive micro-basin level. Groundwater Management Committees (GMC) were conceived as village level institutions comprising both men and women farmers. Several GMC's within a given hydrological boundary together formed a Hydrological Unit Network (HUN).

As part of knowledge building, locally generated data was used to raise awareness on common issues related to groundwater distress at individual farm level, as well as at the unit level. This set in motion discussions on causes and effects. Data gathered round the year was deliberated upon, culminating in a Crop Water Budgeting (CWB) workshop prior to the cropping season. The CWB assessed the best crop combination that was suited to the entire micro-basin. Based on their understanding, farmers adopted suitable agricultural practices that cut annual groundwater use.

The decision on crop changes was also voluntary, respecting the farmer's traditional knowledge and wisdom in taking most appropriate decisions. Institutions acted as pressure group to advocate changes in cropping patterns, and sustainable agricultural practices like use of bio-fertilizers. The government, along with banks, provided necessary investments to support building of water harvesting structures. Farmers also improved pump efficiency, constructed new wells and revived abandoned wells and recharge structures.

The results were gratifying. Crop diversification resulted in 32 crops as against 14 earlier. Water guzzlers like paddy, sugarcane, banana, turmeric, and mulberry yielded to less water consuming crops like peanuts and lentils. Groundwater exploitation was substantially reduced, between 20-60 percent. And the sowing season is no longer one of despair.

The best part of the APFAGMS success is that the concept is fast catching the imagination of ordinary farmers and policy-makers alike. The Economist, in a lead

story (May 22, 2010), *Making Farmers Matter*, says: "The entire water department of Andhra Pradesh has been trained in the basic principles; Maharashtra has three similar projects under way; and Gujarat, Orissa and Tamil Nadu are keen to follow suit." The author of the article was clearly impressed, adding: "It's a great project and I hope that it flourishes, and its message spreads."

Indeed the message of APFAGMS has spread far and wide. The Ministry of Water Resources, Government of India has recommended the APFAGMS model for adoption by the different state governments. World Bank has recognized it as an alternative model of Demand-Side Groundwater Management, which it plans to replicate in groundwater stressed areas of the world.

Other important visitors to the project include the State Assembly Speaker of Rajasthan leading a team of 15 Members of Legislative Assembly (MLAs). Similarly the *Irrigated Agriculture Modernization and Water Resources Management (IAMWARM)* project of Tamil Nadu sent 32 engineers for training on Demand-Side Water Management. FAO also made a presentation on the methodology and achievements of APFAMGS to the Parliamentary Forum for Water, a top-level decision-making forum on water issues in the country.

### 3. Cleaner fishing harbours, Dhamara shows the way

Since 1964, the Government of India has been investing in the infrastructure development of fishing harbours and fish landing centres. And yet, most fishing harbours remain ill maintained. Hygiene and sanitation conditions in most harbours and fish landing centres fall far below internationally accepted standards. Fishing harbours are a weak link in the present production chain in India with implications not only for human and environmental health, but also for fish prices, particularly exports.

To address this problem the government and FAO collaborated to build the technical knowledge and institutional capacity to upgrade fishing harbours to international standards. The (2007-09) project was implemented at the Dhamara Fishing Harbour in Orissa on the east coast of India. Dhamara was designed as a model fishing harbour through a combination of

hardware such as upgrading of infrastructure and software like stakeholder participation in management.

Pilot activities involved all key stakeholders, with boat owners and crew, ice and transport suppliers, and men and women traders and processors, participating in the consultations, training and awareness-raising activities. Finally, a harbour management society was established including the above stakeholders in December 2007.

The Fisheries and Animal Resources Development Department of the Government of Orissa issued a resolution constituting the Management Society, Dhamara Fishing Harbour (MSDFH). It comprises 14 members, two from the fishermen's group, one from service providers, one from the apex body of fishermen cooperative societies, and the rest from various state government agencies. MSDFH was registered under the Society Act, 1860 and vested with the responsibility for the management of Dhamara Fishing Harbour. It was also given powers to receive grants, collect fees and incur expenditure and appoint a secretary to take charge of the day-to-day management of the fishing harbour.

At the very outset the society tried to identify and analyze the various stakeholder groups, taking note of their specific needs and capacity for management. This process also examined how well the stakeholders were organized and the functions and roles of existing associations. It also looked at their specific concerns and interests, ensuring women stakeholders were involved in all stages of project implementation.

Assessment of existing facilities and services as well as the outcome of the stakeholder consultations became the basis for the recommendations for infrastructure upgrading and sanitation. This included the installation of a cattle grid at the main entrance to prevent entry of animals; regular bacteriological testing of water; construction of sun shade for trucks waiting to load fish; installation of low fish sorting platforms and provision of fish rinsing shower heads over these platforms; provision of power washing attachments; and adequate lighting to enable night-time work. It was a long list. Similarly for software issues there was a long list of dos, basically aimed at standardising clean harbour practices.

Capacity development was the centrepiece of the project design that has left the stakeholders able to participate fully in the management of the fishing harbour.

#### 4. Community based fisheries management in South India

Over the years, there has been a growing realization among fishers that things were not quite right with their profession. The realization came the hard way when dwindling catches and declining catch quality started affecting their profits and livelihoods. Then the 2004 tsunami struck, bringing to light some of the resource issues that were hitherto neglected. The attention that the fisheries sector got in the aftermath of the disaster created an environment conducive to addressing the problems of fishers and the fisheries sector.

Like many other countries, India too faces the challenge of improving fisheries management in spite of having the relevant policy support. Indeed, most of the time policies, regulations and management measures – such as zone regulations, mesh regulations, and seasonal regulations are formulated in a top-down fashion, with limited or no stakeholder participation. Not surprisingly, adherence to regulations has been poor which gives rise to the need for integrating ‘management’ with livelihoods and development, a concept not very well understood or accepted by many in the sector.

To bridge this gap, FAO partnered with the South Indian Federation of Fishermen Societies (SIFFS) to attempt pilot trials on community based fisheries management. SIFFS identified the Nagapatinam coast in Tamil Nadu and the Alapad Village along Kerala coast for these trials – two areas where SIFFS had already been working with traditional fishers panchayat as well as elected panchayat leaders under the Panchyati raj system. It had also established traditional fisher marketing cooperatives in Nagapatinam.

The experiment in Nagapatinam, including the Coromandal coast, during the post tsunami period was facing problems of over-capacity from the large number of motorized boats. The introduction of large ring seine nets and expanding pair trawling operations only made things worse for the smaller fishermen.

Through in-depth consultations with village leaders, SIFFS realized that fisheries management and related issues needed to be addressed collectively. Consensus on the issue resulted in the formation of a 21-member Nagai Karai Fisheries Management Council. The council selected 12 villages to be represented in a management committee which was charged with undertaking fisheries management debates, advocacy for fishers welfare, and obtaining consensual decisions.

In the Alapad experiment it was found that the 17-kilometre coast of Alapad village was crowded by too many high investment ring seiners (60 foot and above, with powerful out-board or in-board engines), each operated by 40 to 60 fishers. This was an unsustainable and uneconomical situation; and SIFFS found in the elected Panchayat an effective ally and institution for change. The panchayat president along with nine traditional institutions, Karayogams, discussed the issue and decided to constitute a democratic forum.

The result was formation of the Fisheries Management Council Alapad (FIMACA) in December 2009. The council took a series of bold decisions such as putting on hold any increase in the number of ring seine boats operating from the village. Other steps included replacing ring seiners only by smaller boats; a ban on night fishing; and a reduction in the number of trips by ring seiners to one per day.

The Nagai and Alapad interventions both resulted in micro-level initiatives of community based fisheries management. The results have been encouraging, as local problems of fishermen have been addressed through their own institutions. A rising demand for community-based management appears to be spreading to other villages and districts. There is also a growing demand to allow local village councils to have representation in district and state level council federations to fully involve the government in the process of building true fisheries co-management.

The follow-up *Fisheries Management for Sustainable Livelihoods project*, initiated by the Government of India with FAO support, is further building on the previous achievement, this time in Tamil Nadu and Pondicherry.

## List of selected projects

Title	Symbol	EOD	NTE	Budget (\$)
Equipment for Geophysical Wing of the Central Groundwater Board	TCP/IND/6702	1977	1978	220 000
Pilot Plant for Manufacturing Small Prefabricated Water Control Structures	TCP/IND/6701	1977	1978	121 000
Desert Locust	TCP/IND/8803	1978	1978	250 000
Supply of Seeds and Pesticides	TCP/IND/8804	1978	1979	150 000
Fertilizer Storage Improvement and Training	TCP/IND/8908	1979	1980	100 000
Modernization of the Plywood Industry in India	TCP/IND/8906	1980	1981	116 000
Propeller Nozzles for Trawlers	TCP/IND/0005	1980	1981	106 000
Agricultural Education Centre for Advanced Studies	IND/78/020/ /01/12	1981	1991	5 460 239
Date Palm (Phase II)	IND/80/043/ /01/12	1981	1990	473 037
Watershed Management, Planning and Monitoring	TCP/IND/0001	1981	1981	209 000
Fish Hatchery Consultants	UTF/IND/151/IND/A	1981	1995	204 025
TCDC Regional Fertilizer Managerial/Supervisory Training	GCP/IND/149/UK	1982	1993	101 853
Establishment of the Wildlife Institute	IND/82/003/ /01/12	1983	1991	1 949 848
Introduction of Ferrocement as an Alternative Construction Material for Inshore Fishing Vessels	TCP/IND/2307	1983	1985	190 570
Forest Fire Control	IND/84/003/ /01/12	1984	1993	4 876 234
Agricultural Education and Research	IND/83/020/ /01/12	1984	1996	4 412 314
Development of Low Cost Canal Lining	IND/84/006/ /01/12	1984	1993	347 416
Investigation of Drainage on "Black Cotton" Soils	IND/82/059/ /01/12	1984	1991	333 563
Use of Video for Farmers Training	TCP/IND/2305	1984	1985	141 241
Postgraduate Agricultural Education Advanced Centres	IND/85/020/ /01/12	1986	1997	12 059 339
Wood Industries Training Centre – Bangalore	IND/85/015/ /01/12	1986	1993	3 527 810
Postgraduate Education in Nutrition and Child Development	IND/86/012/ /01/12	1986	1998	1 206 816
Remote Sensing for Land Development	IND/80/011/ /01/12	1986	1992	642 170
Video for Rural Communication and Training	TCP/IND/6655	1986	1988	225 772
Farm Data for Agriculture Price Policy and Resource Allocation	TCP/IND/6656	1986	1988	206 000
Outfitting and Demonstration of Ferrocement Inshore Fishingvessels	TCP/IND/6652	1986	1987	168 368
Strengthening of Training Programmes in Quality Control Andpreshipment Inspection of Food Products (Tech. Units: Fio)	TCP/IND/6653	1986	1987	148 181
Establishment of Animal Disease Laboratory	IND/85/065/ /01/12	1987	1994	671 896
Training in Agricultural Project Planning and Implementation	TCP/IND/6760	1987	1988	194 000
Operation Flood – National Dairy Development Programme	UTF/IND/148/IND/B	1988	1992	3 906 225

Title	Symbol	EOD	NTE	Budget (\$)
Biotechnology in Plant Improvement	IND/87/017/ /01/12	1988	1998	1 138 002
Coastal Aquaculture	IND/85/059/ /01/12	1988	1994	935 026
Bio-Fertilizer Development	IND/86/003/ /01/12	1988	1997	750 773
Assistance to Wildlife Institute	IND/88/008/ /01/12	1988	1993	470 915
Fishing Craft Development in Kerala	TCP/IND/8852	1988	1990	153 600
Monitoring and Evaluation of Social Forestry Project	GCP/IND/154/SWE	1988	1993	120 986
Dairy Development Board – Operation Flood III (Phase II)	UTF/IND/155/IND/B	1989	1998	4 186 979
Community Education Media Experiment Uttar Pradesh	FFHC/IND/150/MUL	1989	1995	184 772
Food Quality Control	TCP/IND/8956	1989	1991	150 000
Agricultural Sector Assessment and Project Formulation Mission	TCP/IND/8854	1989	1989	144 400
Phytotron Facility at IARI	IND/90/007/ /01/12	1990	2002	2 109 492
Long Term Policy Strategies for Vegetables Oils	TCP/IND/8957	1990	1991	222 500
Review of Meat Industries Sector and Related Activities	TCP/IND/8955	1990	1991	100 000
India – Development and use of Hybrid Rice Technology	IND/91/008/ /38/99	1991	1996	2 943 826
National Network of Genetic Resources Conservation Centres and Community Seed Banks	FFHC/IND/181/BFW	1991	1996	281 031
Policy Analysis Using Farm Level Data	TCP/IND/0053	1991	1993	233 989
Improvement of Post-Harvest Technology in Rural Areas	PFL/IND/003/PFL	1991	1994	103 056
Indian Council of Forestry Research and Education (ICFRE)	IND/92/038/ /01/99	1992	2000	1 684 270
Wildlife Management and Ecodevelopment Planning	IND/92/007/ /38/99	1992	1995	1 048 246
Technical Assistance to the Third National Seeds Project	UTF/IND/156/IND/B	1992	1998	347 006
Remote Sensing for Land Resources Management	IND/91/029/ /38/99	1992	1994	174 399
Agroforestry Systems	TCP/IND/2255	1992	1993	159 000
Development/Strengthening Plant Quarantine Facilities	IND/92/032/ /01/99	1993	2003	3 887 920
TA to the National Agricultural Research Project II, India	UTF/IND/157/IND	1993	1999	1 752 289
Formulation of Forestry Action Plan	IND/93/021/ /01/99	1993	1995	388 429
Demonstration and Training in Primary Processing of Small Diameter Logs	TCP/IND/2257	1993	1995	212 500
Prevention of Vitamin A Deficiency in Rural Areas of West Bengal	TCP/IND/2361	1993	1995	193 000
Assistance to Oil Palm Smallholders	TCP/IND/2358	1993	1995	184 511
Training in Decentralized Planning	TCP/IND/2254	1993	1995	149 693
Desert Locusts Emergency Assistance	TCP/IND/2359	1993	1994	100 000
Forestry Research, Education and Extension (Training Component), India	UTF/IND/159/IND/B	1994	1999	5 867 977
Integrated Pest Management Programme Development	IND/93/018/ /01/99	1994	2001	938 683
Bio-Village Demonstration	IND/94/012/ /01/99	1994	2002	453 323
Andhra Pradesh Forestry Development	UTF/IND/158/IND/B	1994	1999	229 997
Development and Application of Modern Bio-Technology	IND/94/01T/ /08/12	1994	1995	200 000
Training in the Use of Integrated Remote Sensing and Geographic Information System (GIS) in Forestry	TCP/IND/2362	1994	1996	184 000



Title	Symbol	EOD	NTE	Budget (\$)
Development of Small-Scale Livestock Activities – Sikkim	TCP/IND/4451	1994	1996	176 183
Training in Forest Fire Management Planning	TCP/IND/4452	1994	1995	119 000
Madhya Pradesh Forestry Project – Training Component	UTF/IND/160/IND/B	1995	1999	1 819 762
Horticulture, Madhya Pradesh	TCP/IND/4453	1995	1996	282 000
Beekeeping by Landless Farmers in Karnataka State	TCP/IND/4556	1995	1997	267 000
Follow-Up to Operation Flood III, India	UTF/IND/161/IND	1996	2006	1 922 468
Assistance in Transfer of Technology on Vegetative Propagation of Walnuts ( <i>Juglans Regia</i> )	TCP/IND/4554	1996	1998	276 000
Development of an Integrated Plant Nutrition Systems Methodology	TCP/IND/6611	1996	1998	180 000
Agricultural Human Resources Development Project – India (Ahrd)	UTF/IND/162/IND	1997	2001	14 201 347
Training in Sea Safety Development Programmes	TCP/IND/6712	1997	1999	395 515
Greenhouse Floriculture Technology for Small-Scale Farmers	TCP/IND/6713	1997	1999	363 000
Utar Pradesh Forestry (Placement and Support of Overseas Training)	UTF/IND/164/IND	1998	2003	996 106
Manpower Development in Food Safety and Quality	TCP/IND/8822	1998	2000	260 000
Assistance to Apiculture in Karnataka State (Phase II IND/4556)	TCP/IND/7823	1998	1999	120 000
Development of Oilseeds and Pulses Programme	IND/96/001/ /09/12	1998	2001	109 136
Development of Hybrid Rice Technology	IND/98/140/ /01/99	1999	2002	973 500
Pilot Project for the Elimination of Micronutrient Malnutrition in Tamil Nadu	TCP/IND/8824	1999	2001	316 000
Needs Assessment and Project Formulation for the Development of an Integrated National Quarantine Service	TCP/IND/8925	1999	2001	178 000
Consultancy on FMIS, UPFD – India	UTF/IND/166/IND	1999	2003	165 356
Emergency Supply of Agricultural Inputs in Cyclone Affected Districts of Orissa	TCP/IND/9066	2000	2001	343 000
Greenhouse Floriculture Technology for Small-Scale Greenhouse Floriculture (Phase II)	TCP/IND/9065	2000	2000	101 000
Kerala Forestry Project – India	UTF/IND/170/IND	2001	2003	825 120
Assessment of Feasibility of Proposed	TCP/IND/0168	2001	2002	365 000
Purchase of Elisa Kits for RP and PPR from m/s BDSL, India	UTF/IND/171/IND	2001	2002	338 762
Strengthening the National CODEX Committee	TCP/IND/0067	2001	2003	268 000
Improvement of Banana Production for Small-scale Growers	TCP/IND/0169	2002	2003	165 165
Health Management of Shrimp Aquaculture in Andhra Pradesh	TCP/IND/2902	2003	2005	373 812
Pilot Project for Developing National Food Insecurity and Vulnerability Information and Mapping System (FIVIMS) in India	TCP/IND/2903	2003	2005	222 270

Title	Symbol	EOD	NTE	Budget (\$)
Andhra Pradesh Farmer-managed Groundwater Systems	GCP/IND/175/NET	2004	2009	6 784 539
Programme Support to Nationally Executed (NEX) Land and Water Programme in India	GCP/IND/177/NET	2004	2013	4 695 903
Andhra Pradesh Water Management Project	GCP/IND/176/NET	2004	2010	4 646 565
Promoting Livelihood Improvements in Dryland Farming on the Deccan Plateau	GCP/IND/174/NET	2004	2008	3 161 023
Apples Production Improvement	TCP/IND/2904	2004	2005	365 277
Development of technical capacity base for the promotion of organic agriculture	TCP/IND/3003	2005	2007	212 140
MoU between UNDP and FAO for Technical Support to Fisheries Sector of the Post-Tsunami Recovery Framework	UNTS/IND/001/UNJ	2006	2008	146 849
Pilot project for developing a national Food Insecurity and Vulnerability Information and Mapping System (FIVIMS) – Phase II of TCP/IND/2903	TCP/IND/3101	2006	2007	103 000
Capacity building in support of Cleaner Fishing Harbours	TCP/IND/3102	2007	2009	318 000
Immediate technical assistance to strengthen the control of Highly Pathogenic Avian Influenza (HPAI)	OSRO/IND/802/USA	2008	2011	1 220 000
TCP Facility	TCP/IND/3201	2008	2009	216 601
Fisheries Management and Sustainable Livelihoods Project in Tamil Nadu and Puducherry, India	UTF/IND/180/IND	2010	2011	2 125 000
Reversing Environmental Degradation and Rural Poverty through Adaptation to Climate Change in Drought Stricken Areas in South India: A Hydrological Unit Pilot Project Approach – MSP	GCP/IND/181/GFF	2010	2013	909 090
Improving productivity and quality of litchi in Bihar	TCP/IND/3202	2010	2011	396 000
Support to FAO's pro-poor livestock policy program in India	MTF/IND/183/FFD	2010	2012	200 000
A Strategy and an Action Plan for an Animal Identification and Traceability System for India	TCP/IND/3302	2010	2011	156 000

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