



THE WEST AFRICAN INTEGRATED PRODUCTION AND PEST MANAGEMENT PROGRAM (IPPM)



Location: Benin, Burkina Faso, Mali, and Senegal

Successful implementation of field-based learning in Farmer Field Schools (FFS) has facilitated ecologically resilient farming systems in West Africa. By creating a knowledge base of locally adapted best practices and revitalizing farmer and agricultural extension networks, the West African Integrated Production and Pest Management Program improves regional food security, while reversing the environmental degradation associated with conventional farming practices.

CHALLENGE

West Africa is rich in biodiversity, with five major ecological zones: *rain or humid forest*, is best suited for cultivating tubers, plantains and tree crops; *forest-savanna ecotone* supports production of seasonal food crops and vegetables, perennial tree crops, and livestock; *savanna* has low rainfall conditions and supports grain farming and livestock rearing; and the *Sahel*, which has minimal rainfall, is more adapted to extensive livestock systems.¹

Reflecting the region's ecological diversity, indigenous farming practices across West Africa have evolved to include a vast array of systems adapted to local biophysical conditions and socio-cultural needs.² Over the past 40 years, practices have changed dramatically in response to environmental and economic stresses, demands of a growing urban population, impacts of international and national policy shifts, and development of intensive cash-cropping systems.³ These shifts have not, however, prevented growing poverty and food insecurity, and may even have exacerbated these problems.⁴

SPECIFIC CHALLENGES FACING WEST AFRICAN AGRICULTURE

For decades, rural communities have relied on staple food crops such as millet and sorghum, supplemented by occasional meat and dairy from livestock. After a period of public investments in agriculture to meet the food needs of growing urban populations in the 1970s and 1980s, implementation of the structural adjustments programs in the 1990s led to West African countries promoting cultivation of cash crops—cotton, nuts—for export. Cotton is now the primary export product in these countries, contributing over 35 percent to Benin, 37 percent to Burkina Faso and 35 percent for Mali's exports in 2010.⁵ As the countries shifted a significant proportion of farm production towards export-oriented cash crops, their imports of food have greatly increased.⁶ In the past decade, West Africa's attempts to emulate the Green Revolution's Asian agricultural productivity gains have resulted in increased monoculture production and growing reliance on agro-chemicals.⁷

These shifts have had significant impacts on the health, environment, and well being of rural communities. Cotton production is one of the most chemical-intensive crops in the world, accounting for 24 percent of global insecticide sales.⁸ While the systematic application of pesticides is generally limited to cotton and maize,⁹ abundant credit packages and government

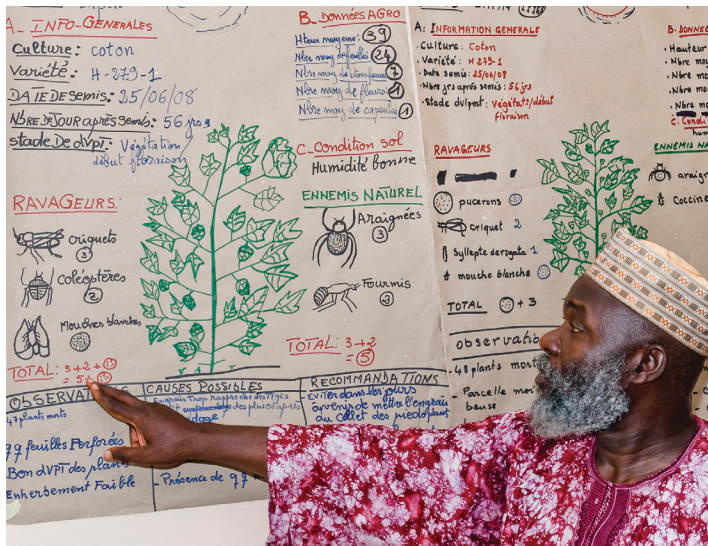
support programs have created a black market for pesticides, with rice and vegetable farmers purchasing the extra chemicals.¹⁰ Chemical pesticide surge in West African countries impacted farmers and communities' health, and reports were made of increasing livestock poisonings, deaths of earthworms (important for soil fertility), bees (which are crucial for pollination)—, snakes, birds and other wildlife after pesticide application.¹¹ Pesticide costs have also risen, skyrocketing by 80 percent in Benin during the 2000-2001 planting season,¹² which led to increasing farmers' poverty and indebtedness. The high prevalence of pesticide use, abundance of toxic chemicals in the soil and water, adverse effects on human health, soil fertility and biodiversity points towards the need for alternative solutions.

protection divisions, and agricultural extension offices) provide institutional and technical support to set up and run the first field schools and train the trainers. As national and local capacity develops, the IPPM program is able to run on its own, led by farmers, local government and NGO partners. In some cases, FAO may help link the emerging national programs with regional and international donors. In Mali, for example, the partnerships ultimately convened 28 government agencies, 35 farmer organizations, 15 NGOs, 14 donor projects 66 other organizations and 884 FFS facilitators.

Initially, master trainers from Indonesia and the Philippines jump-started the first program in Ghana. They trained farmers in the FFS methodology and conducted season-long investigations of local agricultural challenges. Communities designated farmers with strong leadership qualities to join more intensive training sessions for facilitators, where they developed skills in participatory adult education methodologies and group dynamics. These facilitators, with sixty-seven percent farmers and the remainder coming from local agricultural extension offices, are responsible for guiding FFS participants through the learning process.

The program has broad objectives: build local farming capacity, improve food security and livelihoods, raise awareness about the harmful health and environmental impacts of overusing chemical pesticides and introduce farmers to alternative methods of pest management. The program's success in disseminating IPPM techniques to control pests led to expansion into other areas, including soil fertility management, marketing, cotton-cereal-livestock rotations, environmental monitoring for pesticides and human health risk and climate change adaptation. Future projects are planned in water conservation and agroforestry.

The program utilizes field trials where farmers design multiple plot experiments to compare the effectiveness of conventional farmer practice with IPPM techniques. IPPM vary according to the agro-ecosystem and the issues farmers identify as local priorities. Farmers' field experiments can test various combinations: yield effect when chemical fertilizer applications are reduced and leguminous cover crops are added; impacts of different pest management practices on pest damage and yield; production costs and returns of varying planting density; and impacts on dietary diversity—and/or farm and household income—when additional food crops and livestock are integrated into a formerly monoculture



Chakirou Lawani, FFS program coordinator in Benin. © William Settle

RESPONSE¹³

First introduced by the UN Food and Agriculture Organization (FAO) in Ghana in 1996, the Integrated Production and Pest Management Program (IPPM) was modeled after the successful 1980s Farmer Field School (FFS) programs in Southeast Asia.¹⁴ IPPM was implemented in Senegal, Mali, and Burkina Faso in 2001, and extended to Benin in 2006. In 2009, IPPM programs were launched in Guinea, Mauritania, and Niger.

The program is based on participatory education and engaging diverse partners, including farmer groups, NGOs, governments and donor agencies. National government partners (ministries of agriculture, environment crop

cash crop system. Farmers actively manage the plots and make weekly observations on different practices, noting the prevalence of pest populations and beneficial organisms (natural enemies, earthworms, pollinators in and around fields), the amount of pest damage during crop development, and the variation of yields and other outputs. Farmers gather as a group after field monitoring to present and discuss their findings and to make any necessary crop management decisions.

Typically, FFS are set up in a given village with neighboring farmers joining weekly study sessions at experimental fields. Farmers spend half a day in the fields studying ecology and measuring impacts, then convene for group discussion and analysis. A sequential training model was introduced to accommodate farmers who wanted to join a FFS far from their own village. They convene less frequently, conducting training over several two- to three-week intensive periods throughout the crop cycle.

To increase program efficacy, a cluster-model was added into the FFS programs. Over many decades, the FAO's integrated pest management program found that if FFS graduates are isolated, their confidence shrinks, diminishing their ability to disseminate knowledge. The cluster approach seeks to overcome this dynamic by establishing a critical mass of IPPM-trained farmers in a given locale.

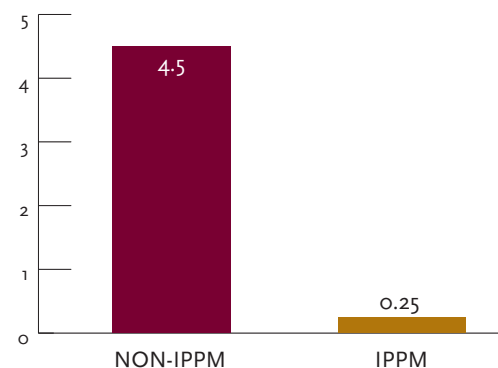
RESULTS¹⁵

- From 2002 to 2012, more than 150,000 smallholder farmers were trained, as well as 3,500 facilitators from farmer cooperatives, civil society organizations, and local governments in the four countries.
- Through training provided by the FFS in Senegal, farmers began to shift from the use of synthetic pesticides towards the use of botanical and biological pesticides. As a result, they saw a 92 percent reduction in the use of synthetic pesticides.
- Mali has seen synthetic pesticide use drop more than 90 percent for the tens-of-thousands of cotton farmers that have benefited from the farmer field schools.
- IPPM training has resulted in increased cotton yields from 14 to 70 percent in Burkina Faso.
- The use of organic materials (i.e. compost and manure) has seen a 400 percent increase in Mali, which led to a significant increase in soil fertility.
- In Northern Benin, 700 rice farmers in one irrigated polder area saw their yields triple while their mineral fertilizer usage was cut by two-thirds.¹⁶
- As the program continues to grow, the FAO anticipates that by 2017, an additional 400,000 farmers will take part in the FFS.

Benin: Fewer Inputs, Higher Yields

From 2006 to 2008, successful implementation of the IPPM program allowed farmers to produce more than twice their previous rice yield, using less than

Figure 1: Pesticide use according to IPPM practice in Mali (liters per hectare)



“The program motivated us because the production potential of our group significantly increased. Our fields have allowed us to earn income never achieved by our group.”

– IPPM farmer in Ndiomy, Senegal



A farmer facilitator speaks to a IPPM training group, Kodith, Senegal. ©FAO/Olivier Asselin

half the previous amount of chemical fertilizers. Farmer surveys also indicate that FFS participants required 13 percent less seed, while obtaining net increases in production thanks to more efficient transplanting and spacing techniques. Farmers also increased their use of organic matter—in rice by 260 percent, in cotton by 342 percent and in vegetable systems by 481 percent.

Burkina Faso: Fewer Inputs, Higher Yields

Surveys of 336 farmers indicate that Burkina Faso's FFS rice farmers reduced input costs by lowering planted seed quantity by 31 percent. These farmers increased their compost use in rice systems by 464 percent (in lieu of chemical fertilizer) from an average of 406 kilogram per hectare to 2,287 kilogram per hectare.¹⁷ After training, the percentage of farmers using some level of organic soil amendment increased from 21 percent to 71 percent.

Mali: Increased Income, Reduced Pesticide Use, Improved Soil Health

From 2001 to 2009, an estimated 10,600 irrigated rice farmers and 195 facilitators received IPPM training. A 2009 study comparing IPPM practices for irrigated rice to conventional production methods found a 41 percent increase in farmers' mean net income. Additionally, a survey of 65 villages that participated in 2007 and 2008 programs indicated that farmers employing IPPM used 94 percent fewer liters per hectare of pesticide and four times the amount of compost compared to neighboring conventional farmers. Increased organic soil matter allows for greater water and nutrient retention, while creating an ideal environment for microorganisms, which aid in nutrient transport and mitigate soil-borne diseases.

Senegal: Increased Yields and Income, Reduced Pesticide Use

An independent study comparing conventional rice cultivation to IPPM over the course of 14 FFS seasons found that IPPM practitioners had a 25 percent increase in median yield over farmers in the conventional practice—from 5.19 tons per hectare to 6.48 tons per hectare—with a net income increase of \$387 per hectare per farmer. A 2009 independent survey of 80 participating FFS vegetable farmers found that 74 of them (92 percent) had reduced the use of commercial synthetic chemical pesticides, while the use of bio-pesticides and neem extract (a locally produced extract which repels many pests) went up significantly post-training, from 2 to 60 farmers (3 to 75 percent) and from 2 farmers to 66 (3 percent to 82 percent), respectively. On average, farmers used 3.2 fewer liters of chemical pesticides per hectare and saved \$60 per hectare.

They saw a 61 percent increase in net overall crop value—equivalent to \$1,332 per hectare—from cost-saving changes.



Farmer facilitator Momodou Ndiaye holds a bottle of organic pesticide made from neem, Louga, Senegal. ©FAO/Olivier Asselin

Economic and Ecological Diversification

In cotton producing areas, the program emphasizes crop diversification, encouraging farmers to grow cotton in rotation with other crops such as corn and soy. This provides a safety net, ensuring that farmers will have more than one crop to sell if the market crashes for a particular commodity. Incorporating leguminous and subsistence crops into the cotton system has strong potential to improve the food security and the health of farming communities. In Mali, farmer interest in mango, cowpea, sesame, millet, sorghum, karité, and jatropha led to FFS training for these crops.

Increased Awareness Regarding Pesticides and Human Health

IPPM project partners also began monitoring chemical pesticides in water. In a 2004 pilot study, water samples from the Senegal River were analyzed for pesticide residues. Eighty-four water samples revealed 105 instances of chemical pesticides. Nineteen different pesticides were detected—40 percent were above the European Maximum Tolerable Risk, which clearly indicates threats to environment and human health. The IPPM program is currently sampling rivers in six West African countries; another project is underway to increase the pesticide-detection capacities of local laboratories.

Multi-Tiered Knowledge Networks

By relying on stakeholder participation at all levels, the West Africa IPPM program has greatly contributed to the development of social capital within the region's agricultural community. At a national level, ministries of agriculture, environment, and health are closely involved in program development. Local government entities have also been active, bringing in representatives and agricultural extensionists. At a community level, partnering with farmer organizations such as the Union Nationale de Producteurs de Coton du Burkina in Burkina Faso and the Federation Nationale des Maraichers des Niayes in Senegal bolsters the FFS model's credibility and provides farmer organizations with resources to improve marketing and other capabilities. At the individual level, technical training improves farmers' decision-making abilities and fosters collective action opportunities.

Forward Linkages

The IPPM project creates opportunities for further development initiatives. Although the hands-on FFS approach is designed for success in low literacy areas, it consistently stimulates demand for literacy training. The IPPM program connects its FFS networks to national literacy groups, which might otherwise lack access to certain rural communities.

As the program continues, positive social, economic, and environmental impacts of individual projects continue to accrue. By reincorporating the complexity of natural ecosystems into the agricultural landscape, both farmers and crops become more resilient to climate, weather, and markets variations. Moreover, the program's emphasis on capacity building and creating accessible and locally relevant knowledge bases has laid the foundation for self-sustaining regional changes.

This case study was produced by the Oakland Institute. It is copublished by the Oakland Institute and the Alliance for Food Sovereignty in Africa (AFSA). A full set of case studies can be found at www.oaklandinstitute.org and www.afsafrica.org.

“Our union requested training in IPPM for vegetable crops because the vegetable growers of Dioila had enormous problems with insect damage. Thanks to this training, all the women working in this production area have improved their techniques and yields have doubled or tripled.”

—Ms. Diakite Fanta Diarra,
President, Dioila Union of
Vegetable Producers, Mali

FOR MORE INFORMATION

www.oaklandinstitute.org
www.afsafrica.org



Farmers look for insects while others measure plants in a IPPM rice field school, Kodith, Senegal. ©FAO/Olivier Asselin

ENDNOTES

- 1 Gyasi, Edwin and Juha Uitto. *Environment, Biodiversity and Agricultural Change in West Africa*. Tokyo, New York and Paris: The United Nations University Press, 1997.
- 2 *Ibid.*
- 3 Kütting, Gabriela. "Globalization, Poverty and the Environment in West Africa: Too Poor to Pollute?" *Global Environmental Politics* 3, no. 4, (2003): 49.
- 4 McIntyre, Beverly. *International Assessment of Agricultural Knowledge, Science and Technology for Development, Sub-Saharan Africa Report*. Island Press, 2009.
- 5 World Bank. 2013. Africa Development Indicators 2012/13. Washington, DC: World Bank. doi: 10.1596/978-0-8213-9616-2. <https://openknowledge.worldbank.org/bitstream/handle/10986/13504/9780821396162.pdf?sequence=1> (accessed July 1, 2014).
- 6 Moseley, W.G., Carney, J. and L. Becker. "Neoliberal policy, rural livelihoods and urban food security in West Africa: A comparative study of The Gambia, Cote d'Ivoire and Mali." *Proceedings of the National Academy of Sciences* (2010) 107: 5774–5779.
- 7 Kütting, Gabriela. *Op. Cit.*
- 8 *Ibid.*
- 9 *Ibid.*
- 10 Krupnik, Timothy. "West African rice farmers explore alternatives to cheap, dangerous insecticides." Rodale Institute, September 14, 2007. <http://newfarm.rodaleinstitute.org/international/features/2007/0907/burkinafaso/krupnik.shtml> (accessed July 1, 2014).
- 11 Williamson, Stephanie. *The Pesticide Detox: Towards a More Sustainable Agriculture: Breaking the Barriers to IPM in Africa: Evidence from Benin, Ethiopia, Ghana and Senegal*. London: Earthscan, 2005.
- 12 *Ibid.*
- 13 Unless otherwise indicated all sources for this section are from Settle, William and Mohammed Hama Garba. *The West African Regional Integrated Production and Pest Management Program*, Food and Agriculture Organization, 2009. http://www.fao.org/uploads/media/WA_IPPM_case%20study_web_1.pdf (accessed July 1, 2014).
- 14 Van den Berg, Henk and Janice Jiggins. "Investing in farmers: The impacts of farmer field schools in integrated pest management." *World Development* 35, no. 4 (2007): 663-686.
- 15 Unless otherwise indicated all sources for this section are from Food and Agriculture Organization of the United Nations. *AGP - IPPM in West Africa*. <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/ippm-in-west-africa/en/> (accessed July 8, 2014).
- 16 Settle, William. "West African farmers learn in their fields." Thomson Reuters Foundation. May 2, 2012. <http://www.trust.org/item/20120502110000-1pjs2?> (accessed July 9, 2014).
- 17 Settle, William. FAO, direct communication, December 28, 2010.

FRONT PAGE PHOTO:

Farmers in a IPPM rice field, Kodith, Senegal. ©FAO/Olivier Asselin