



AGRICULTURE GLOBAL PRACTICE TECHNICAL ASSISTANCE PAPER

IMPROVED NUTRITION THROUGH AGRICULTURAL EXTENSION AND ADVISORY SERVICES

CASE STUDIES OF CURRICULUM REVIEW AND OPERATIONAL LESSONS FROM INDIA

Suresh Chandra Babu, Meera Singh, T. V. Hymavathi, K. Uma Rani, G. G. Kavitha, and Shree Karthik

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ABBREVIATIONS AND ACRONYMS

ATMA	Agricultural Technology Management Agency
EAS	Extension and Advisory Services
ICAR	Indian Council of Agricultural Research
ICDS	Integrated Child Development Services
IFPRI	International Food Policy Research Institute
KVK	Farm Science Center (<i>Krishi Vigyan Kendra</i>)

MANAGE	National Institute of Agricultural Extension Management
NFHS	National Family Health Survey
PDS	Public Distribution System
SAFANSI	South Asia Food and Nutrition Security Initiative
SAU	State Agricultural University

EXECUTIVE SUMMARY



Even after several decades of green revolution, malnutrition continues to be a major development challenge in much of South Asia, and India has a major share of the malnourished people in the region. The nutritional issues in India are complex and therefore require a multifaceted, multidisciplinary solution. One facet of the solution is increasing knowledge about the causes of and solutions to malnutrition at the farm household level through agricultural extension. Disseminating nutrition-sensitive agricultural knowledge is not currently an activity of agricultural extension in India, but there is great potential for integrating it through the well-established network of extension officers. For nutrition goals to be integrated into extension, the curricula provided to current and future agricultural extension agents must be revisited. As part of the South Asia Food and Nutrition Security Initiative (SAFANSI), this paper focuses on approaches to incorporating such nutrition content into the agricultural extension curriculum. Three state agricultural universities in Tamil Nadu, united Andhra Pradesh, and Bihar were used as case studies for the curriculum review. Through these case studies, face-to-face consultations at the national level down to program implementation at the village level have been developed. These include consultative workshops, and a conceptual framework and strategy for incorporating nutrition into extension curriculum development to improve nutrition outcomes. This strategy, detailed in this report, includes opportunities for collaboration from the national level to the community level. Specific lessons and follow-up actions are outlined that may be useful for other South Asian countries.

CHAPTER ONE

INTRODUCTION

Achieving nutritional and health objectives through agricultural development has picked up momentum recently after the realization that food production and food and nutrition consumption must be effectively integrated (Ruel, Alderman, and the Maternal and Child Nutrition Study Group 2013). This is largely because agricultural production gains in the past did not result in the nutritional transformation needed for reducing high levels of malnutrition. The case of India is typical. This paper explores how increasing nutritional knowledge through agricultural interventions can help improve agriculture-nutrition outcomes. It focuses specifically on approaches to improving the content and delivery mechanism of extension and advisory services to more effectively integrate agriculture-nutrition information.

In general, agricultural programming could be better integrated with nutrition goals and outcomes in two broad pathways. First, as part of the multisectoral approach to nutrition, the agriculture sector has a role to play at various levels—from the policy design stage to program implementation. Second, agricultural interventions could be made nutrition sensitive and nutrition smart more directly through better assessments of the nutritional situation in communities and improving the design of agricultural systems that meet nutritional goals. This paper focuses on the latter approach to integration of agriculture and nutrition through improving the curriculum of the extension and advisory services (EAS) and thus increasing the effective delivery of nutrition knowledge.

Nutrition-sensitive agricultural interventions have been recommended for some time to address the shortcomings of agricultural transformations that did not fully address food insecurity and malnutrition in several developing countries (Kataki and Babu 2002). Yet serious attempts to understand how agricultural and food production improvements could be fully translated into increased food and nutrition security at the household level remain limited (Levinson and Herforth 2014). Making food and agricultural systems and program and policy interventions more nutrition sensitive requires identifying opportunities for improving the intensity of nutrition knowledge use at various stages of production, marketing, and

consumption. Agricultural transformation that occurred in several developing countries, particularly in South Asia, largely ignored nutritional transformation. Achieving nutritional transformation along with agricultural transformation requires making agriculture and food systems nutrition sensitive in all subsectors of agriculture (Herforth, Jones, and Pinstrup-Andersen 2012).

Several institutional innovations are needed to make the food and agricultural system nutrition sensitive. A strategic intervention for translating the foods produced at the farm level into increased nutrition in rural households is through teaching how to effectively use the foods consumed to achieve better nutritional outcomes. Nutrition knowledge needs to be effectively shared with the rural households in the context of food and agricultural systems and along commodity value chains. A major opportunity for such knowledge transfer could be through the EAS that reach out to the rural population, albeit with varying degrees of efficiency and effectiveness. However, there are several operational challenges, discussed below, to enhancing the nutrition knowledge of the EAS and using them to effectively transfer the knowledge. Little is known about how EAS could be used as a delivery mechanism for integrating agriculture and nutrition (Fanso et al. 2015).

The role of EAS in enabling agricultural transformation has been recognized, and efforts are under way to revive their role in several developing countries (Sulaiman and Davis 2012). In essence, EAS encompass a set of organizations and their activities that deliver knowledge, information, and services that are demanded by the rural population, including farmers and other actors who use such services to enhance their productivity and livelihoods (GFRAS 2010). EAS in developing countries continue to be provided by the public sector, although they are increasingly becoming pluralistic in nature, with the private sector and nongovernmental organizations playing important roles (Yuan and Babu 2015). Depending on the farming system and agricultural development goals, the roles of EAS are also changing (Anderson and Feder 2007). Even the public sector provision of EAS has gone through several changes to meet the needs of the agricultural development interventions designed and implemented by the governments of developing

countries (Babu, Gajanan, and Sanyal 2013; Feder, Willett, and Zijp 2001). For example, the traditional role of extension in transferring research and technology to farmers through farmer training programs has evolved to include services such as organizing farmers for collective action, joint processing and marketing, and public-private partnerships (Yuan and Babu 2015). The changing role of EAS from a technology transfer paradigm to a need-based, demand-driven model has also helped EAS address the vast information and knowledge needs of the rural population, including natural resource management, climate change, human immunodeficiency virus (HIV)/AIDs, and value chain development. Opening up EAS to other areas must be recognized as necessary and must be effectively capitalized to achieve the Millennium Development Goals, including the needed nutritional transformation. However, it is not clear how to reorganize and reeducate the actors and players of EAS in developing countries to respond to the increasing and new demands on their services (Sulaiman and Davis 2012)

Agriculture-nutrition integration, in terms of increasing content related to nutrition security and reducing over-nutrition, can be facilitated through EAS. However, EAS participants need to acquire current knowledge concerning how to meet nutrition needs and learn new approaches to delivering such knowledge. They must also learn innovative methods of designing and implementing agricultural nutrition interventions that address local agricultural challenges. In this paper, we develop an operational strategy to incorporate such nutrition knowledge in EAS in India. Based on case studies of three states with differing nutritional challenges, we develop operational lessons for developing countries for integrating nutrition transformation objectives into their EAS.

In India as a whole, an estimated 300 million people do not have access to a food supply that sufficiently meets their basic energy needs, and over half of the population is deficient in essential micronutrients such as iron, vitamin A, and iodine (World Bank 2012). Adequate nutrition not only increases well-being but also aids mental development and growth, leading to increased learning potential. For this reason, increased nutrition has direct links to increased productivity and economic growth.

The problem of malnutrition in India is complex and, therefore, requires a multidimensional approach. The combination of a high rate of poverty with recent economic growth in India has led to the coemergence of malnutrition, undernutrition, and hidden hunger in terms of micronutrient deficiencies and overnutrition, leading to rises in obesity and long-term health risks such as diabetes and other noncommunicable diseases. Another major cause of malnutrition in India is gender inequality. The low social status of women leads to a lack of quality and quantity in their diets. In addition, girls often lack proper nutrition education; therefore, mothers do not have the proper knowledge of key nutritional and child feeding practices such as breastfeeding, leading to inadequate nutrition in children.

Although integrated rural development programs, child nutrition interventions, and primary health care programs address nutrition education for pregnant and lactating mothers, a major opportunity in rural India, however, is to link nutritional goals and challenges to agricultural interventions. EAS provide a major opportunity for improving agricultural programming and knowledge sharing, which could be an effective pathway to address nutritional challenges. However, it is not clear who the actors and players are within the institutional architecture for agricultural intervention and programming in EAS. Little is known about the extent to which such nutrition content is covered by the agricultural education curriculum. Further, to guide policy makers in reforming current agricultural education, an operational strategy is needed for using the

revised curriculum in capacity development programs both in universities and midcareer training activities.

Undertaken as part of the World Bank–sponsored South Asia Food and Nutrition Security Initiative project on introducing nutrition content into tertiary extension education, this study begins with the objective of incorporating nutrition-related content in the curriculum of agricultural extension education at select state agricultural universities (SAUs) to address agriculture-nutrition integration in India. The specific objectives of the paper are to map the institutional architecture for agriculture-nutrition integration, select three SAUs, and review the curricula of both preservice and in-service training to assess how much nutrition instruction is received by extension workers or those training to be extension workers. Finally, following this assessment, the study provides recommendations and develops a strategy for incorporating nutrition-related content into the agricultural education curricula. An action plan to develop nutrition content for SAU curricula was developed and field-tested through stakeholder consultations at various levels.

The rest of the paper is organized as follows. The next chapter reviews current literature on agriculture-nutrition linkages to develop a conceptual framework for integrating nutrition into agricultural extension programs. Research methods and approaches are given in chapter 3. Results and discussions are given in chapter 4. Lessons from the case studies are presented in chapter 5, and chapter 6 consists of concluding remarks.

CHAPTER TWO

A CONCEPTUAL MODEL FOR INTEGRATING NUTRITION INTO AGRICULTURE EXTENSION

Although nutrition goals have been identified as part of agricultural research and development programs for the past 40 years (Pinstrup-Andersen, de Londoño, and Hoover 1976), explicitly integrating nutrition goals as part of interventions has not been given serious consideration until recently (Kataki and Babu 2002). Integration of nutrition objectives as part of EAS is much more recent (Sulaiman and Davis 2012). A major intervention approach to achieving nutrition goals through agriculture has been the home garden, which required nutritionists and horticulturists to collaborate to identify nutritional problems, develop plant-based interventions, and train rural households to grow nutrient-rich crops. Although successful pilots have been reported in the past three decades, it has been extremely difficult to scale up plant-based nutrition intervention, partly because of poor mainstreaming of nutrition-sensitive agriculture interventions in agricultural EAS (Babu 2002).

Integrating nutrition into EAS has been attempted at various levels. At the national level, nutrition policies have recognized the need to teach farm and rural households the importance of nutrition- and plant-based interventions. However, much of this remains to be accomplished. Despite helping transfer technology relevant to specific crops already grown, extension services have not helped much to diversify crops so that growers can gain higher incomes and better nutrition (Yu and Mwangi 2015). Extension departments and the sectors addressing nutritional challenges such as health and social welfare did not converge at different levels. Convergence is a major challenge for the sectors involved in nutrition, even leaving EAS out of efforts to coordinate action. There have been some efforts to integrate EAS in regions where malnutrition is high. For example, Integrated Child Development Services (ICDS) in some areas of Tamil Nadu State in India were able to interact with agricultural extension workers to identify foods that are available in abundance and at the lowest cost to use as part of a diet developed for nutrition interventions (Pandi 2014). However, the development of comprehensive programs at the national level that will integrate EAS at the policy, program, and project levels remains limited.

There are several reasons for such poor integration of nutrition into EAS. First, extension systems in developing countries have focused on the production aspect of food security, yet achieving food security at the individual level also depends on access to food; the proper use of food; and clean water, sanitation, and hygiene (Babu, Gajanan, and Sanyal 2014; FAO 1996). The challenges of food access and other elements of food security are considered beyond the scope of EAS, as there may be overlap at the village level because of the presence of primary health and social welfare departments.

Second, failures of home gardens in some areas and the limited success of attempts to scale up such efforts indicate that EAS may also fail if additional nutrition goals are introduced. This fear, combined with existing inefficiencies, made policy makers reluctant to discuss additional responsibilities for the extension system.

Third, the emphasis of EAS on activities that helped in technology transfer—following the Green Revolution model of extension—kept food consumption and nutrition goals out of EAS as production and availability goals continued to dominate EAS. The recent concept of nutrition value chains shows some promise of enhancing the nutritional content of food by addressing the processing methods to preserve the nutritive value of crops produced and consumed by rural poor and malnourished people. However, this effort in the context of EAS is entirely new. As part of their nutrition education programs, several countries have deployed home economists who spend most of their time developing recipes that do not reach the farming communities. For example, the CGIAR centers have been investing in food processing scientists over the years with limited transfer of their knowledge to local institutions. Agricultural universities have food and nutrition faculties that routinely develop new recipes and approaches to preserve nutrition in key crops consumed by poor households. However, as a result of poor integration of research and home economics extension, the reach of these nutrition-sensitive approaches has been limited.

Fourth, new efforts to introduce nutrition-rich foods have had some success in selected developing countries (Babu 2000, 2002). However, such approaches seem to have made progress on a few selected crops for which evidence

has been accumulating, particularly in Africa, and have not been systematically considered as part of the larger nutrition agenda.

Fifth, earlier attempts toward income diversification though moving from subsistence farming to commercial agriculture has shown the negative effects of commercialization (Kataki and Babu 2002). Although this gave the EAS system an opportunity to correct this imbalance by emphasizing nutrition in its work, the opportunity was missed because of a lack of capacity in the system to address nutrition. This continues to be a challenge even now, but awareness has recently increased among development partners of the desirability of using EAS as a vehicle for nutrition education (GFRAS 2010).

Finally, recent advances in the breeding of food crops to enhance their nutritive value through biofortification has brought to the forefront the need for new extension approaches for such crops (Low et al. 2007). In addition, agricultural programming could help increase the accessibility of safe foods (for example, foods free of mycotoxins), increase water use efficiency and make clean water available for households, and encourage better land management to incorporate complementary outputs such as fuel for improved food preparation. In summary, although the agriculture sector has long been recognized for its contribution to food security, because of the multidisciplinary nature of nutritional challenges, its role in achieving nutritional goals has not been adequately emphasized in agricultural programming in general, and EAS in particular, in developing countries.

The conceptual framework shown in table 2.1 illustrates the process of using a multidisciplinary and nutrition-smart extension curriculum to strengthen the links between agriculture and nutrition in the context of India. Agricultural production strategies in India have resulted in food self-sufficiency over the past 30 years, and yet nutritional challenges remain, with more than one-quarter of malnourished children in the world calling India their home (Gillespie, Harris, and Kadiyala 2012).

The development outcomes of strengthened agriculture-nutrition linkages include increased production and household income as well as better-balanced diets and

TABLE 2.1. CONCEPTUAL FRAMEWORK FOR DEVELOPING A CURRICULUM TO ACHIEVE AGRICULTURE-NUTRITION LINKAGES

Nutritional Challenges of Agricultural Communities	Agriculture-Nutrition Curriculum	Locality-Specific Design of the Curriculum	Nature of Agricultural Extension Systems and Nutrition Programming	Nutrition-Informed Agricultural Communities
<i>Problem Identification</i>	<i>Content/Curriculum Needs</i>	<i>Conditioning Factors</i>	<i>Contextual Factors for Inclusive Extension</i>	<i>Developmental Outcomes</i>
Obesity: men, women, children	Nutritive value of food	Subsistence/commercialization of agriculture	Agricultural extension department (state government)	Increasing Production and Income
Consumption pattern changes: high-value agriculture, fat, sugar	Monitoring nutritional status/indicators of nutrition	Systems of organization of production activities (for example, contract farming, public procurement)	Farm science centers (KVKs; <i>Krishi Vigyan Kendra</i>) at central, state, and district government levels	Agriculture and Nutrition Outcomes
Children under 5 years of age: stunting, wasting, underweight	Study of consumption patterns/nutritional intake through dietary surveys	Agroecology/natural resource constraints (for example, endowment, water, soil, rainfall)	Integrated child development services (social welfare at the village level)	Balanced Diet and Nutrition
Balanced diet: food and nutrition security	Biofortification principles and solutions	Market linkages to nutritive foods and their supply	Nongovernmental organization/private sector actors	Balanced Diet and Nutrition
Specific vitamin deficiencies: iron, vitamin A, iodine	Contextualization and decentralization of nutrition problems and nutrition solutions	Locality-specific (decentralized) nutritional issues and their potential solutions	University extension/outreach programs (research stations, district level)	Balanced Diet and Nutrition
General micronutrient malnutrition: “hidden hunger”	Market-based solutions to address nutrition challenges (for example, value chain approach)	Currently existing nutrition intervention programs (for example, for children, pregnant/lactating mothers, elderly population)	Agricultural Technology Management Agency (ATMA)—state district/block levels	Balanced Diet and Nutrition
Agriculture and nutrition interaction: creating a nutritional imbalance in communities	Systems thinking to link agriculture system to nutrition challenges and outcome	Local institutions (nature of, functions)	Other sectors interacting with agriculture	Balanced Diet and Nutrition

increased nutrition. To address the nutritional challenges of agricultural communities, extension curricula must be tailored to the local context. To design a relevant and effective curriculum, we must first apply it to a specific problem at the lowest administrative level (block or village level). For each development problem, we can identify information gaps that need to be filled to design context- and locality-specific curricula to meet development outcomes.

The conceptual framework begins with the nutritional challenges in the first column of table 2.1. For example, in recent years, obesity in India has been increasing, causing serious health risks. To address this problem, an effective curriculum should inform beneficiaries about the nutritive value of food. The curriculum needs to consider conditioning factors specific to the village's or block's agricultural system—for example, subsistence agriculture or commercialized market-oriented production. In addition, the curriculum should consider the nature of the local agricultural ecological and production systems and the opportunities they provide for improving the nutritional content of local diets. Institutional interventions through agricultural extension departments at the state or district level need to be studied for their intervention approaches to and methods of nutritional problem solving.

To change food consumption patterns, particularly away from processed foods high in fat and sugar, the curriculum should include content covering the important indicators of nutrition consumption and other methods of monitoring nutritional challenges that could be addressed through agricultural interventions. The curriculum should pay attention to what agricultural extension system operates in the area, such as farm science centers, for the training of the trainers and the development of course content relevant to the locality, particularly for the in-service training programs and the training offered to the extension staff on a regular basis as part of the research-extension continuum.

Many early childhood nutritional indicators—such as the prevalence of stunting, wasting, and underweight—have been explicitly included in development goals. To address these issues, village-level dietary surveys need to be conducted to determine nutritional patterns and levels of

consumption. The curriculum developed should consider agroecological and natural resources constraints in the area that may affect the availability of nutritious foods. Nutritional programming that could benefit from a multidisciplinary curriculum in India could include ICDS, which provide social welfare to households at the village level through identifying the malnourished children and providing nutritious snack supplements.

Most agricultural development efforts have focused primarily on increased production to increase caloric intake, neglecting underlying hidden nutrition challenges. Micro-nutrient malnutrition and vitamin deficiencies such as those in iron, vitamin A, and iodine are prevalent among the rural poor in India. The contextualization and decentralization of nutrition challenges and their potential solutions are important for creating an effective curriculum. The design of the curriculum needs to consider existing agriculture and nutrition intervention programs at the local level (for example, value chain, child nutrition interventions, lactating mother programs) to make it locality specific and to identify opportunities for areas in which the curriculum could be used. This might occur through state university outreach and extension programs or through Agricultural Technology Management Agency programs at the state, district, and block levels.

We use the above conceptual framework to understand the challenges, constraints, and opportunities for effectively integrating nutrition goals, challenges, and agricultural approaches into EAS for enabling a nutrition transformation in rural India. We accomplish this through three sets of analysis. First, we systematically map the actors and players in the institutional architecture that links agricultural and nutrition challenges to EAS in India. Second, we undertake a systematic and an analytical review of the current agricultural and nutrition curriculum in three states that have attained varying degrees of progress in their nutritional outcomes—Tamil Nadu, with the highest level of progress; united Andhra Pradesh, with moderate progress; and Bihar, which is one of the states most affected by malnutrition. Third, using personal interventions and consultative group discussions at various levels, we develop an operational strategy for a nutrition smart EAS in India.

CHAPTER THREE

RESEARCH METHODS AND APPROACHES

To identify opportunities to effectively integrate nutrition goals into EAS, several sets of discussions and interviews were conducted in various parts of India. The first consisted of community-level consultations through focused group discussions. Several rounds of focused group discussion were held between 2010 and 2014 in more than 30 villages in Tamil Nadu. The discussions revolved around information needs of the farming community and how extension services could be better organized to provide the knowledge and information needed to improve the income and welfare of rural households. Consultations were then conducted with the various levels of EAS in the southern states of united Andhra Pradesh, Karnataka, and Tamil Nadu to understand the information sources, capacity levels of EAS functionaries, and the ability of the system to meet the nutrition education needs of rural communities. Further, interviews were conducted with scientists who are involved in adoptive research in the KVKs to understand their perspectives on the nutritional challenges, how they addressed these challenges in their research, and how their research results are translated into extension messages in rural communities.

This was followed by the mapping of the various approaches and pathways to nutrition education in the current system of pluralistic extension services operating in India. This process used the Net-Map method through consultations with various extension functionaries and policy makers through both individual interviews and joint discussions. The net-mapping process helps reveal the institutional architecture of EAS in the context of policy making, program design, and implementation and also helps show who is involved in decision making at various levels, their power relations, and how they are linked to various elements of EAS at the state and at central government levels.

To revise agricultural extension and nutrition curricula effectively to increase nutritional impact, it is important to understand the key actors and players involved in translating nutrition goals into nutrition and agricultural programs that have greater impact in the field. Agricultural universities are the primary medium for training future extension agents, researchers, and trainers in the field (Glendenning, Babu,

and Asenso-Okyere 2010). Case studies were conducted in three states of India—Tamil Nadu, united Andhra Pradesh, and Bihar—and three local collaborators from the corresponding SAUs were selected to methodically conduct the studies.

The next part of the project involved face-to-face consultations with relevant ministry officials, faculty members, and program managers of nutrition interventions based on agriculture. These consultations were critical in obtaining these actors' respective nutrition objectives, approaches, and experiences. In Hyderabad, a training of faculty of SAUs and staff of relevant program managers was conducted to obtain feedback on the strategy for revising the curriculum. A workshop was organized on November 10, 2014, in New Delhi to bring together agriculture and nutrition experts, program implementers, and policy makers to reflect on the findings of these studies and recommend ways to enhance the quality of nutrition-smart curricula in the university and extension systems.

State-level curricula in nutrition at the university level and for preservice training were also evaluated, based on specific criteria, including the following:

- » Opportunities for integrating nutrition curriculum and the good practices followed by the faculty members and the extension systems into the agricultural education system
- » Pathways for effectively transferring nutrition knowledge into EAS
- » Specific programs for enhancing the capacity for nutrition extension
- » Current capacities
- » Future needs
- » Existing gaps in universities and state agricultural departments for nutrition integration in training programs
- » Opportunities for integrating cross-disciplinary levels at the district and state levels through collaboration among the ministries
- » The role of EAS in reaching out to rural women

CHAPTER FOUR

RESULTS AND DISCUSSION

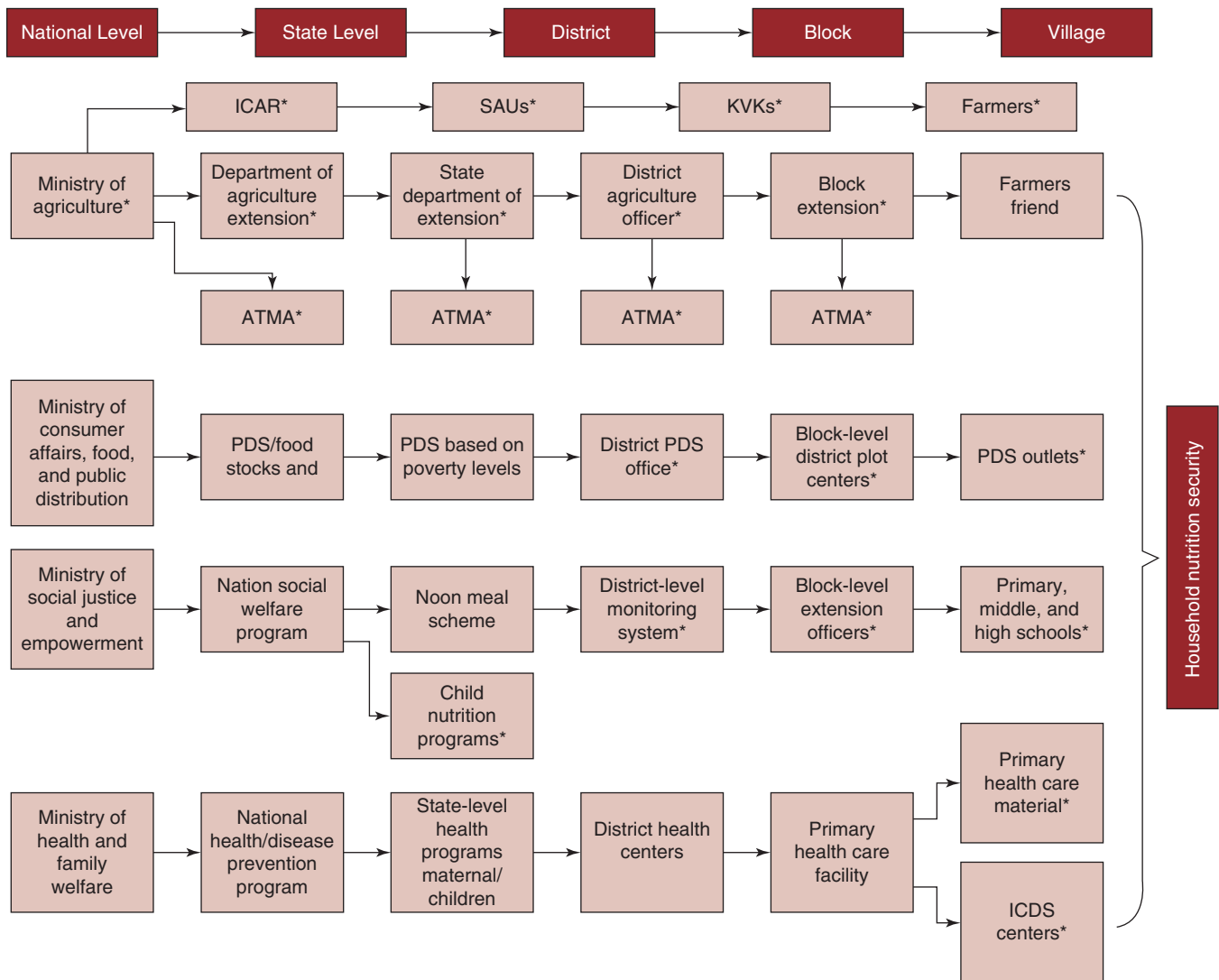
MAPPING INSTITUTIONS FOR INTEGRATING AGRICULTURE AND NUTRITION

Although agriculture (that is, food production) is very closely linked to nutrition (that is, food consumption) in theory, in most program implementations of education and extension, the two concepts are presented and pursued separately. The agriculture-nutrition-health continuum is increasingly recognized as the paradigm for nutrition interventions in rural areas of developing countries. However, until recently, agriculture has rarely been explicitly leveraged as a tool for improving health and nutrition. The first 40 years of development efforts and interventions focused primarily on the Green Revolution and the increased production of staple foods. Although these efforts did lead to major improvements in food security in terms of caloric availability at the national level, this has not been sufficient to improve nutrition security.

Nutrition is a multidisciplinary issue with dimensions of health, social welfare, and agriculture and should therefore be addressed in some capacity by all key actors and stakeholders in these areas. However, although the need to address nutrition challenges has been recognized, a paradigm shift is still needed so that increased nutrition security is seen as a goal of all agricultural programs. Many nutrition intervention programs already exist in India; however, these are sectoral in nature and typically work with limited coordination. To create a multidisciplinary nutrition curriculum for agricultural extension, it is important first to understand how communities and individuals receive their nutrition information. Figure 4.1 maps the common channels of agricultural-nutrition linkages from the national level to the village level.

At the national level in India, nutrition challenges are addressed through four main government entities: the Ministry of Agriculture; the Ministry of Consumer Affairs, Food, and Public Distribution; the Ministry of Social Justice and Empowerment; and the Ministry of Health and Family Welfare. The Ministry of Agriculture oversees the national and state departments of agricultural extension. The National Institute of Agricultural Extension Management (MANAGE) is run by the central Ministry of Agriculture and is primarily responsible for the training and education of future and

FIGURE 4.1. MAPPING OF CHANNELS OF FOOD, AGRICULTURE, NUTRITION LINKAGES FROM NATIONAL TO VILLAGE LEVELS



Notes: ICAR = Indian Council of Agricultural Research
 *Face-to-face consultations with relevant officials for the study.

current extension officers. In addition, the ATMA programs form a key potential outlet to disseminate locality-specific nutrition messages at all levels. At the block and village levels, block-level extension officers and Farmers' Friends are the primary sources of agricultural advisory services in the field. The Ministry of Consumer Affairs, Food, and Public Distribution, through its Public Distribution System (PDS), provides food at subsidized prices to households below the poverty line, yet it does not emphasize the nutritional content of food packages. Determination of the recipients of this program is based on poverty rates at the village or block level.

The Ministry of Social Justice and Welfare is responsible for the organization of the National Social Welfare Program as well as state-level health programs for children and mothers. In terms of health intervention, the ICDS program is a social welfare initiative that focuses on improving the health of preschool children aged 6 years and under and their mothers. Similarly, the Mid-Day Meals program also focuses on improving the nutrition status of school-age children through better school lunches. However, this program is primarily concerned with increasing caloric intake and is less concerned with the nutritional quality of the food

provided. The Ministry of Health and Family Welfare runs district health centers as well as primary health care facilities at the block and village levels. These facilities are the primary way in which rural communities receive health information. This is an opportunity to disseminate nutrition messages through actors not primarily involved in extension and advisory services.

CASE STUDIES OF STATE AGRICULTURAL UNIVERSITY CURRICULUM REVIEWS

The following three subsections cover the state-specific challenges of nutrition and motivations for revising curricula at the respective SAUs. Also contained are the key elements needed for the revised curriculum to make the greatest nutritional impact in that state through the agricultural extension system.

HIGHLIGHTS OF THE TAMIL NADU CASE STUDY

Major nutritional challenges in Tamil Nadu include high levels of child malnutrition among the poor and tribal populations, and anemia levels are high, especially among pregnant and lactating mothers. The extension system does not disseminate any messages related to nutrition goals, challenges, and solutions that could be addressed through agricultural interventions. Extension services continue to focus on production-oriented messages and recently have moved slowly toward water conservation and marketing messages. Even if the policies are changed to incorporate the nutrition messages, the capacity for disseminating nutrition messages does not exist in the extension system. However, this is slowly changing, with some district-level extension officers undergoing food security and nutrition training through midcareer training programs.

At Tamil Nadu Agricultural University, there are weak linkages between nutritional and agricultural learning. For example, the Horticulture and Home Science departments offer courses on nutrition topics such as nutrition classification and the nutritive value of horticultural crops as well as laboratory classes on nutrition and kitchen gardens. The Home Science department offers courses in fundamental and therapeutic nutrition, along with six

food science courses. However, most future extension officers pursue bachelor's degrees in agriculture, a department that does not offer any nutrition classes. This lack of coordination creates gaps in knowledge within the extension system of nutrition and health outcomes.

The agricultural extension system in Tamil Nadu and the existing network of extension officers present an opportunity to address nutrition challenges through incorporating the nutrition curriculum into the state extension training programs. Increasing the nutrition content of extension education helps ensure that more children grow to have healthy adulthoods, which leads to higher levels of productivity.

The curricula at Tamil Nadu Agricultural University should be revised as follows. The courses on common nutrition problems, nutrient content of foods, and nutrition planning and programming need to be taught at the diploma and BSc levels. Courses on nutrition extension, nutrition for vulnerable groups and nutrition monitoring and evaluation, nutrition program impact assessment, and analysis of socioeconomic and nutrition data should be taught at the MSc level. Some of these courses should be made mandatory for the agricultural economics and agricultural extension curricula at the BSc and MSc levels.

The SAUs are not the only opportunity for strengthening nutrition and agriculture linkages in extension curricula. District KVKs can also provide more multidisciplinary training to midcareer extension officers as well as those involved in agriculture interventions in the field.

HIGHLIGHTS OF THE UNITED ANDHRA PRADESH CASE STUDY

In united Andhra Pradesh, although the nutritional status of children has improved slightly since the last National Family Health Survey (NFHS) by some measures, chronic malnutrition and acute undernutrition in children are still widespread. In addition, micronutrient deficiency in the state is estimated to have risen between NFHS-2 and NFHS-3.¹ Major nutrition-related challenges in the

¹<http://hetv.org/india/nfhs/india1.html>

agricultural communities of Telangana and Andhra Pradesh include malnutrition in children under 5 years of age, infant mortality, maternal and child anemia, acute undernutrition, diabetes, and obesity.

Promoting nutritional goals knowledge in farming communities that could be attained through existing extension activities could be a sustainable approach to improving nutritional content of food access in the state. Extension agents could help disseminate educational messages on adequate nutritional requirements, crop diversification for health, and causes and symptoms of nutritional disorders and deficiencies. It is important that nutritional education messages be tailored at the village or block level to promote the consumption of locally available, nutrient-dense foods. In Andhra Pradesh, although the ATMA approach to extension is slowly being adopted, monthly research extension meetings continue to be held, which provide the opportunity for extension agents to incorporate nutrition content in the messages of the traditional extension system.

Although the extension curriculum at SAUs is comprehensive in terms of agricultural aspects, little to no nutrition-related content is included. Recommendations for curriculum revision include an undergraduate course in the fundamentals of human nutrition. Also, existing undergraduate courses in agricultural economics should include content on the per capita availability of food and food consumption trends as well as content on household food security, including the health impacts of food and their subsequent impact on nutrition. Postgraduate courses on extension education should highlight the health benefits of crop diversification. SAUs also offer a Rural Work Experience program. This program should include nutrition-oriented activities to give future extension agents more practical experience on nutrition issues. It is highly recommended that the curriculum of non-formal education activities, such as in-service training courses for extension agents, include content such as household food security, national policies affecting food and nutrition security, nutrition policies, and methods of preventing and combating micronutrient malnutrition.

In SAUs in Andhra Pradesh and Telangana, recommendations for curriculum and course content changes to reach rural and farming communities include the following:

- » A broad course on human nutrition must be mandatory for all agriculture undergraduate students. Such a course was offered in the 1980s and 1990s when most of the home science faculty members were still with the College of Agriculture.
- » In addition, courses related to nutrition problems, nutrition planning and programming, monitoring and evaluation of nutrition programs, impact assessment of nutrition programs, and crop planning for nutritional outcomes are some of the courses that could be designed and offered at the undergraduate level.
- » Courses related to designing agricultural systems that help in achieving better access to diversified diets need to be taught as part of extension curriculum.
- » Courses related to nutrition planning and programming and nutrition economics should be made mandatory for postgraduates in agricultural extension and agricultural economics.
- » Courses in the diploma training should involve nutrition problem identification, nutrition solution through agriculture and crop planning, and monitoring and evaluation of nutrition interventions. These could be taught as special courses or as part of the curriculum.
- » Because ATMA officials are trained through the state extension training centers, the trainers in these centers have to be trained in nutrition courses as well. To begin with, the curriculum taught at the diploma level could be introduced in state-level training programs of extension officials in ATMA.
- » At the district level, there is a close collaboration and coordination of the food and nutrition training activities of the KVKs and the ATMA training programs through farmers' field schools. The food and nutrition program officers of KVKs should offer specialized nutrition courses to the block technology officers and the farmers' friends in the ATMA system.

HIGHLIGHTS OF THE BIHAR CASE STUDY

Bihar, with a population of approximately 83 million, is the third most populous state in India. The most recent National Family Health Survey revealed that 58 percent of children there are malnourished. The number of children showing signs of wasting has also increased. In addition, the prevalence of anemia among children is as high as 88 percent and is approximately 60 percent among pregnant women. Micronutrient deficiency, or “hidden hunger,” is often overlooked by nutrition interventions as well as agriculture interventions. Major micronutrient deficiencies in Bihar include chronic deficiency of vitamins and minerals such as iron, vitamin A, iodine, and zinc.

In Bihar, the major areas of nutrition education for extension programs include breastfeeding practices; kitchen gardening; community farming of horticultural products; and water, sanitation, and hygiene. Opportunities exist for the current extension system to address the state-specific nutritional challenges identified above. The current agriculture education curriculum at the SAU includes little nutrition content. However, opportunities exist to reintroduce nutrition courses in the university, diploma, and post-graduate curricula. To increase the impact of the extension system’s nutrition education efforts, the curricula should include content relevant to nutrition problem identification, provision of nutrition solutions, nutrition planning and coordination, program implementation and delivery, monitoring and evaluation, and impact assessment.

Options for operationalizing the revised curriculum and putting it to practical use in the field include the formation of a state-level committee on nutrition education that comprises the agricultural faculty, home science faculty, department of agricultural extension, and state-level ATMA officials. This committee will undertake a rapid assessment of the entry points for nutrition education in all aspects of agricultural extension and identify the curriculum appropriate for university and midcareer courses in nutrition taught to agricultural professionals.

These curriculum development activities could be undertaken in close coordination with existing nutrition intervention programs in Bihar, including ICDS, which focuses

on the nutrition of children and mothers. For example, nutrition education messages could be shared through the Rajiv Gandhi Scheme for Empowerment of Adolescent Girls, which focuses on improving the nutritional and health status of girls aged 11 to 18 through education in life skills, health, and nutrition. When revising the curriculum to focus on mothers and young children, coordination is needed with the Indira Gandhi Matritva Sahyog Yojana, which aims to promote better health care practices for young women during pregnancy, delivery, and lactation. In addition, the Mid-Day Meal program in Bihar aims to improve school enrollment and attendance rates and lower dropout rates in rural areas by providing more nutritious lunches. The school teachers who are responsible for providing the nutritious meals could use lunch time to inculcate nutrition messages to the adolescent girls once a week or five minutes a day during the weekdays when school lunch is provided.

In addition, Bihar is one of the focus states in the National Rural Health Mission. Key components of this program include village-led health plans and the integration of vertical health and family welfare programs to strengthen health care delivery systems. More specific programs, such as the National Iodine Deficiency Disorder Control Programme, provide an opportunity for coordinated nutrition interventions through extension.

NATIONAL PERSPECTIVE ON LINKING AGRICULTURE AND NUTRITION THROUGH EXTENSION

Existing nutrition extension in India is conducted mostly by the Ministry of Women and Development; however, the content of these interventions is specifically health related. They do not address the potential linkage of agricultural interventions to nutrition improvements. In addition, there is very little emphasis from the agricultural ministry on nutrition, as the major focus of this ministry continues to be agricultural production.

Despite the fact that the extension system is increasingly addressing issues related to natural resource management and sustainability, nutrition as a final goal of food production is yet to be taken up seriously by extension functionaries. However, there is now a recognition that at the national, state, and district levels agricultural extension

has the potential for integrating nutrition extension through its network of established outreach channels that connect with farmers.

Finally, it is important that these extension efforts address women specifically, particularly female farmers, for two reasons. First, women in households produce, prepare, and provide the food for the entire family and therefore have the most control over nutrition. Second, female-headed households in India typically have a higher incidence of nutrition and food insecurity. Thus, gender mainstreaming of the nutrition curriculum in agricultural extension is a key strategy for addressing rural malnutrition.

OPERATIONAL STRATEGY FOR THE DEVELOPMENT OF NUTRITION-SMART EXTENSION AND ADVISORY SERVICES

A strategy for capacity strengthening through revising the curriculum of extension education programs to increase nutrition-related content was presented during the New Delhi workshop on November 10, 2014, in collaboration with Digital Green.

To develop a strategy for capacity development for integrating nutrition in the extension system, the first step is to map the current set of capacity development activities offered to extension professionals through SAUs, KVKs, and other Indian Council of Agricultural Research institutions. The next step is to identify what capacities are needed for the successful integration of nutrition in agriculture education programs in these institutions. Specific training and learning activities could then be recommended to develop and strengthen the required capacities.

Because nutrition challenges require multiple sectors to work together, the development of the curriculum to meet the knowledge needs of the extension professionals will have to take a long-term perspective, looking ahead 5 to 10 years in terms of problems and potential solutions. The curriculum must take into account issues related to identifying problems, developing contextual solutions, implementing interventions, monitoring and evaluating

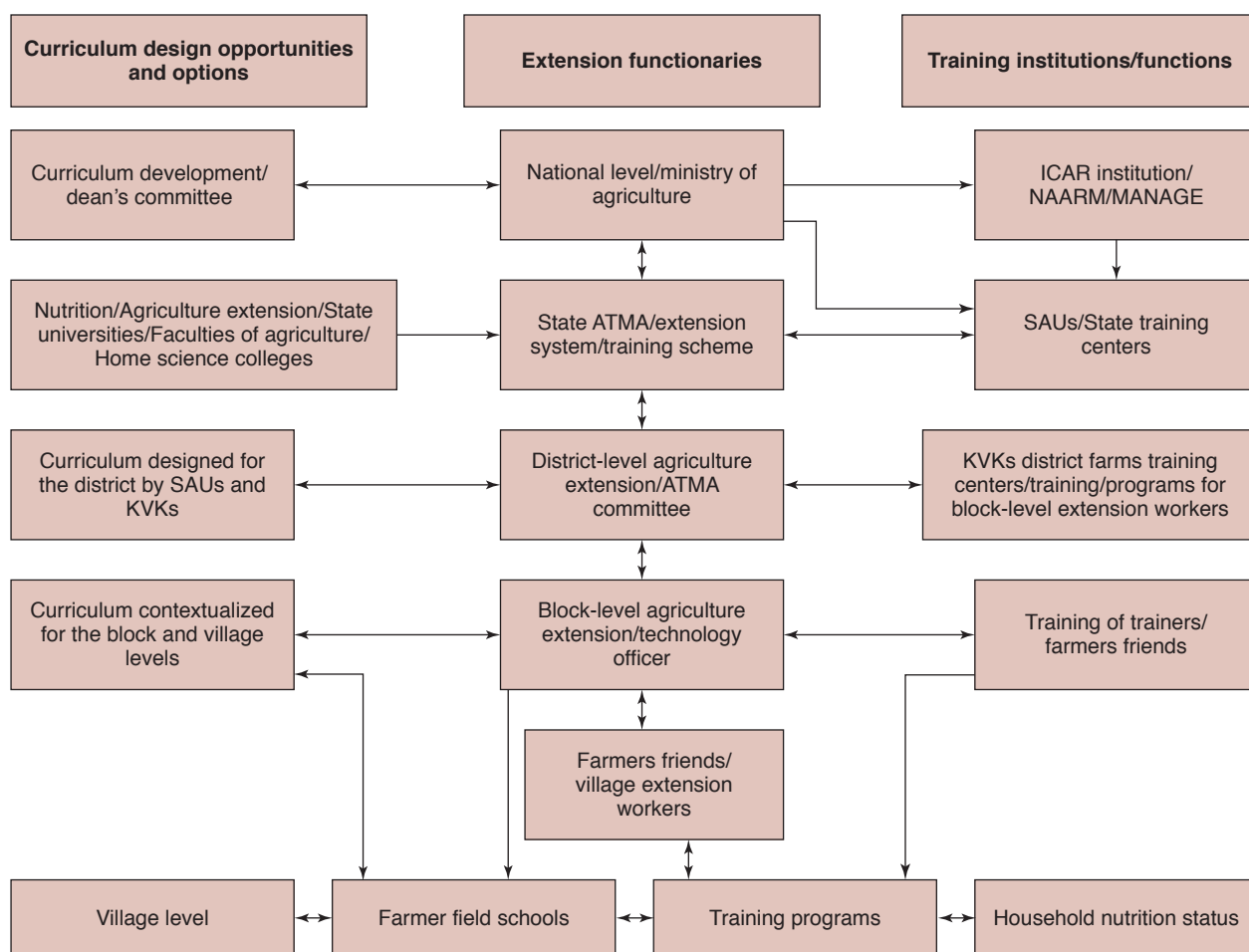
the programs, and refining the nutrition programs and policies at the central and state levels.

State agricultural universities, state departments of agriculture, and KVKs will need guidance on where to invest and how much resources to invest to achieve the goals of curriculum change and integrating nutrition into extension programming. This guidance and support needs to come from a state-level committee that will be established and will function for the next five years. There is also a need for setting up a monitoring and evaluation system to track curriculum and capacity development in the university and extension systems.

Curriculum revision at the national level is organized through a national dean's committee responsible for reporting to the Deputy Director General (Education) of ICAR. Under this committee, several subcommittees and task forces deal with specific thematic areas. A nutrition task force has been formed to undertake a needs assessment at the national level and to assess specific contextual needs and opportunities at the state level. Integration of nutrition into the extension system will require further identification of short-, medium-, and long-term strategic training activities that could be incorporated into the state extension systems.

Figure 4.2 illustrates the curriculum development strategy based on the case studies, consultations, and feedback from local stakeholders. This figure maps how the proposed curriculum design opportunities are linked to the appropriate extension and training institutions at different levels. At the national level, ICAR, the National Academy of Agricultural Research Management, and MAN-AGE should be involved in the curriculum development to identify national nutrition challenges and curriculum needs. The course content and instructional methods will be developed by the faculties of agriculture and home sciences at SAUs and state ATMA offices. Comprehensive course content will be developed by universities for courses at the bachelor's, master's, and doctorate levels, and as continuing learning courses by state extension training centers. Next, the curriculum will be contextualized at the district level by the SAUs and KVKs to reflect local challenges. These institutions can connect the available courses and educational materials to problem solving

FIGURE 4.2. STRATEGY FOR THE DEVELOPMENT OF A NUTRITION-SMART AGRICULTURAL EXTENSION CURRICULUM



Source: Authors.

Note: NAARM = National Academy for Agricultural Research Management

at the district level. Block-level extension officers and those in the Farmer Friends program will then further contextualize the universal curriculum content with examples of block-level challenges and solutions.

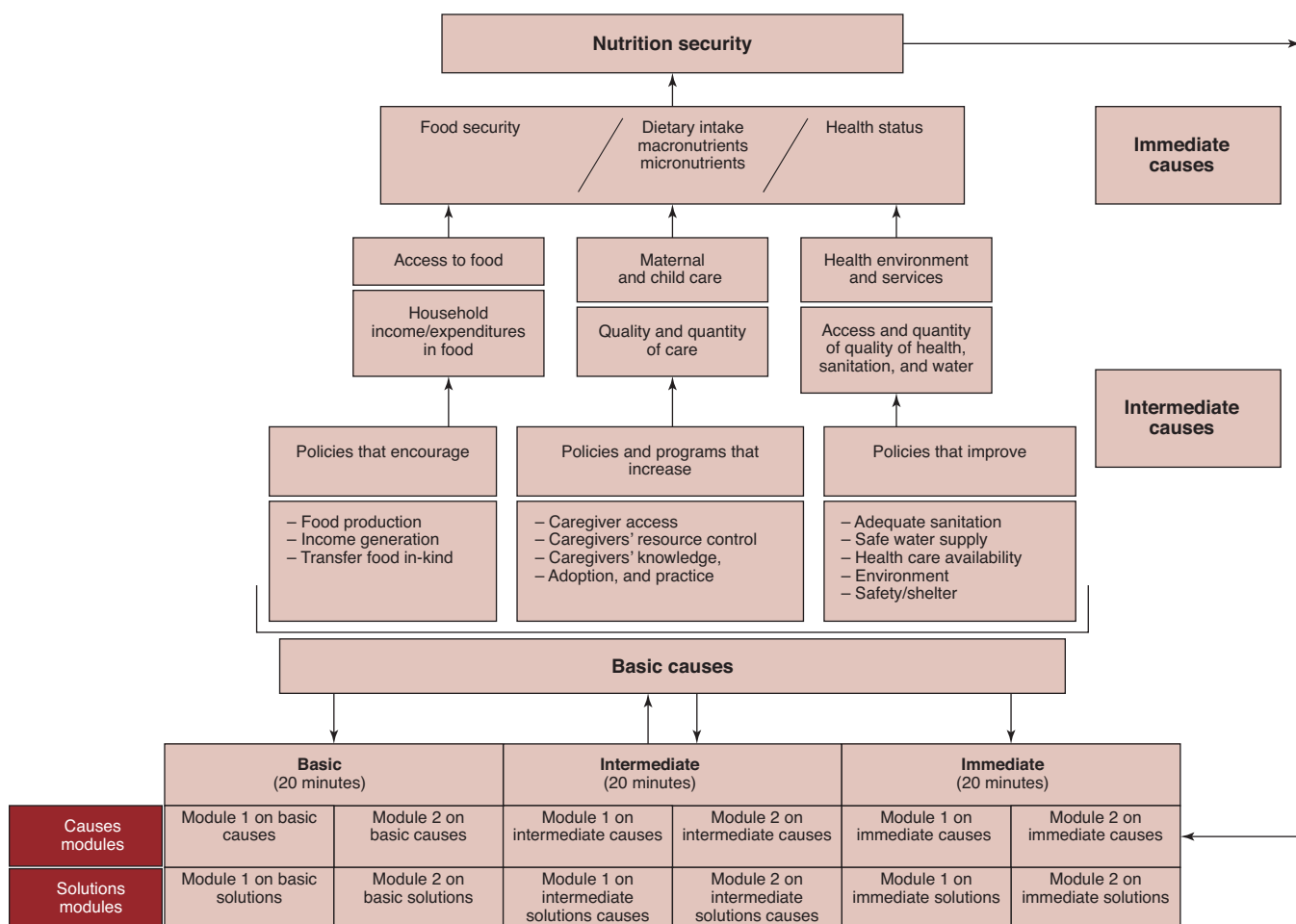
Figure 4.3 uses the conceptual framework outlined in chapter 2 to illustrate how the curriculum strategy should be developed. This conceptual framework was originally developed by UNICEF in the early 1990s to examine child malnutrition and was further improved upon by several researchers based on the need to analyze specific nutritional issues (Babu, Gajanan, and Sanyal 2014; Smith and Haddad 2000, 2015). We further use this framework to identify context-specific nutritional issues and develop solutions at the local levels. The strategy suggested here calls for developing a curriculum in line with the issues,

challenges, and solutions that prevail at the district level. Thus, two broad streams of curriculum are needed: the first covering broad nutrition issues and solutions and the second containing context-specific issues and solutions. Both should be taught at the state and district levels and in regular university courses and midcareer training programs.

A module development plan for a 2-hour session is given at the bottom of figure 4.3. This plan is based on the length a typical farmers' training program or farmers' field school meeting, which lasts 2 hours and 30 minutes, including a 30-minute snack break.

Discussion among state-, district-, and block-level extension officials, KVK scientists, and SAU faculty members points toward the need for specific sets of modules to be

FIGURE 4.3. CURRICULUM STRATEGY AT THE DISTRICT LEVEL USING NUTRITION SECURITY CONCEPTUAL FRAMEWORK



Source: Adapted from Babu, Gajanan, and Sanyal 2014.

developed for addressing nutrition as a development challenge. These sets will include the following:

- 1. Identification of nutrition issues and challenges.** This set of modules will focus on the assessment of undernutrition and overnutrition, including micronutrient malnutrition. Assessment methods will be taught, including the identification of nutrition problems in communities through rapid assessments and interpretation of anthropometry data for designing agricultural interventions. In addition, assessment will include the causal factors specifically contributing to the challenges in the specific states and districts. (Four 10-minute modules.)
- 2. Analysis of the causal factors.** This set of modules will introduce basic methods that will help the field extension officials analyze the indicators

of malnutrition and the associated causal factors. (Four 10-minute modules.)

- 3. Develop interventions and actions.** This set of modules will focus on how to develop interventions based on the identification of causal factors and the analysis of the nutrition situation. Interventions will be developed based on the information analyzed in the above two sets of modules.

Although the above sets of modules are indicative of and have emerged from the reviews and the discussion with the state universities and ICAR officials, further consultation and participatory discussion are needed to refine the contents of the modules and make them meet the standards required at various levels. This must be pursued as the next step in the process.

CHAPTER FIVE

SPECIFIC LESSONS AND THE WAY FORWARD

Several specific lessons emerge from the curriculum review exercise and the consultations undertaken for this project:

- » Nutrition as a subject is largely missing in the curriculum of the agricultural universities that train agricultural extension professionals who could integrate nutrition as a final outcome of the agricultural production process.
- » The current extension reforms undertaken under the rubric of ATMA should be used as an opportunity to integrate nutrition into the extension process. This will create the needed demand for the curriculum development. Without such demand from the extension system, there is little incentive for the curriculum of the universities to change.
- » Midcareer training of the agricultural extension workers does not include nutrition courses, and this has created a vacuum in the extension system in terms of nutrition content.
- » Training of the farmers in KVKs at the district level recognizes the nutrition challenges, but this program does not have a systematic way of training at the block, community, and farmer level or at the extension worker level.
- » At the university level, nutrition is taught in home science colleges, but the graduates of this program do not directly enter the extension services. Conversely, future agricultural extension professionals are not trained in the contents of nutrition-related courses.
- » Nutrition as a development challenge also needs to be taught to agricultural and social sciences students, given the slow progress made in reducing malnutrition levels. This challenge is often highlighted in national discussions on agriculture links to nutrition security, but the next step toward confronting this challenge through the development of capacity for addressing nutritional challenges has yet to gain momentum.
- » Discussions with the Ministry of Agriculture and ICAR indicate that this is also the appropriate time to initiate and guide the curriculum review process as part of the proposed World Bank-funded National Agricultural Education Project.

- » Curriculum development in nutrition-related extension should consider context-specific problems and potential solutions at the district and block levels. Close collaboration between the agricultural departments and the KVKs is crucial for the development and implementation of nutrition training programs in the extension systems.
- » In developing the university-level curriculum, the recognition of the central and state government of the courses proposed and curriculum developed is crucial, as this endorsement will serve as the incentive for universities to develop the courses and for the students who will opt for nutrition courses as part of their course work.

The next step in taking the process forward is to support the following activities:

1. The three states that are already involved in the process to develop the curriculum and course content for the specified courses that could be offered through their agricultural colleges and to the students of agriculture should be given assistance with this process. This will help standardize the course content throughout the country. This could be undertaken as part of the dean's committee review that has begun for the overall review of the courses in the SAUs. Close working relations with the Decentralized Distributed Generation

education and nutrition task force of the dean's committee is essential for this process to start.

2. Several nutrition courses that are offered through home science colleges could be further revised and offered through the agricultural colleges of the SAUs. Specific curriculum development workshops need to be organized under the auspices of Decentralized Distributed Generation education and MANAGE for this process to get started. Funds could be allocated from the National Agricultural Innovation Project, and continued funding from SAFANSI could be identified for this purpose.
3. In all the pilot states, the ATMA implementation needs to start as a pilot program to integrate specific nutrition courses for extension professionals as a midcareer training program at their state extension training institute, which should be given the responsibility of developing the course content for the extension functionaries in line with the broad courses agreed upon for the university levels.
4. The trainers and course content developers should be trained at the national level through MANAGE through regular two-week training programs. MANAGE already conducts similar programs in food and nutrition security. With some additional financial support and technical guidance, this could be made a mission-oriented effort under SAFANSI or as part of the National Agricultural Innovation Project.

CHAPTER SIX

CONCLUDING REMARKS



To address the large disconnect between agricultural growth and nutrition outcomes that currently exists in several developing countries, the paper focused on approaches to incorporating nutrition content into agricultural extension curriculum. To achieve better agriculture-nutrition integration, there is a clear need for making agricultural extension and other intervention programs more nutrition sensitive. This requires understanding of the channels of knowledge flow from the national to the community and household levels and the demand and opportunities for knowledge-based intervention through these channels. Agricultural education as currently designed in India does not prepare future extension and other knowledge workers for such integration. A review of agricultural curriculum with a nutrition focus revealed large gaps and opportunities to address them. In the process of operationalizing the revision of nutrition content and designing capacity-strengthening programs to enhance the knowledge base of midcareer professionals, several lessons emerged for other developing countries that face similar challenges. Given the resource constraints for designing and implementing nutrition programs and agricultural programs faced by the developing countries where malnutrition levels are high, the need for effective integration of agriculture and nutrition through nutrition-sensitive knowledge interventions cannot be overemphasized.

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