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DEVELOPING SUSTAINABLE AND REPLICABLE MODELS ON AGRICULTURE - NUTRITION LINKAGES FOR BETTER NUTRITIONAL OUTCOMES

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EXECUTIVE SUMMARY

India faces great challenges in the front of nutritional status of its population, particularly among women and children in rural areas. Nearly 60 per cent of the rural population of the country is dependent on agriculture and allied sectors for their livelihood. There exist a strong linkage (direct and indirect) between farming systems in rural areas and the nutritional status of the population that depends on it. Hence, identifying the issues around Farming System Nutrition (FSN) linkages, its constraints, and the potential to realise better nutritional outcomes is crucial for achieving nutritional security.

Several scholarly studies have identified the pathways through which farming system nutrition linkages can contribute to nutritional security and have developed a farming system nutrition framework for better nutritional outcomes. However, their analysis falls short of developing a policy framework and identifying a development pathway that integrates the identified farming system nutrition linkages with large-scale social and nutrition security programmes. Such linkages between supply and demand-side factors alone can improve the nutritional status. This study attempts to develop a model that integrates the demand and supply -side determinants of nutritional outcomes by adopting an inclusive and sustainable nutrition value chain approach. The study focused on a) identifying the issues, constraints and challenges in interventions based on the farming system nutrition framework to improve the nutritional status of rural population; b) developing a framework and model that integrates Farming Systems for Nutrition (FSN) approach with the ongoing programmes to provide nutritional security, and c) improving the framework and model developed, through feedback from consultations with stakeholders along the nutritional value chains, and suggestions for its adaptability to specific nutritional challenges across various regions and socio-economic situations.

The study was carried out in the States of Chhattisgarh, Gujarat, Odisha, Telangana and Kerala in three steps. The first step was to review the existing body of knowledge, critically analyse the existing frameworks, identify the constraints and challenges, and propose a model development pathway that integrates FSN with nutritional security programmes. The second step was to map and study the nutritional value chain in five States belonging to five geographic regions of the country by adopting the value chain analysis methodology. The third step was to present this model to various stakeholders along with value chain in the study States, and

improve further through consultations with key stakeholders engaged in making policies and programmes.

The study revealed that

i. At the macro level, improvement of the nutritional status of the population has found a prominent place on the agenda of national programmes and government policies, which have been implemented through various programmes at the State level.

ii. In all the five States studied, except in the case of Chhattisgarh to an extent, there is no evidence of linkage between agricultural development programmes and nutrition-focused programmes.

iii. Although there is a lack of convergence and absence of linkages with agriculture sector in general, there are encouraging initiatives in the States that show the potential for various types of convergence in improving nutritional outcomes.

Based on the value chain analysis, a model was proposed based on experiences on agriculture- nutrition linkages in all of these States. The proposed model emerged after a series of consultative processes and reviews, and discussions with various stakeholders in the nutrition value chain. The major features of the proposed model are

i. Emphasis on convergence of various agencies at the State and grassroots level, which is largely facilitated by PRIs, the decentralised institutions of governance.

ii. An effort has been taken to link agricultural production through suitable institutional arrangements with the activities of programmes for nutritional improvement.

iii. Focus on empowering women in the community by improving their knowledge levels (specifically nutritional literacy) and livelihoods by creating entrepreneurial capabilities.

The proposed model has tried to address the issue of sustainability and replicability by incorporating the components of agriculture-nutrition linkage at the grassroots level, women empowerment, and development of entrepreneurial capabilities among rural women. This model needs further refinement to adapt to specific situations during its implementation in different geographies and socio-economic landscapes of India.

DEVELOPING SUSTAINABLE AND REPLICABLE MODELS ON AGRICULTURE-NUTRITION LINKAGES FOR BETTER NUTRITIONAL OUTCOMES

1. INTRODUCTION

India faces great challenges in the front of nutritional status of its population, particularly among women and children in rural areas. In some of the nutritional indicators like the share of underweight children and incidence of stunting, India's status is worse than that of sub-Saharan Africa (Das, P.K., Bhavani, R. V., & Swaminathan, M. S, 2014). According to NFHS -4 conducted during 2015-16, 38.4 per cent of the children in India are stunted, 21.0 per cent are wasted, and 35.7 per cent are underweight. The Millennium Development Goals Country Report for India in 2016 notes that despite its progress during the MDG period, the country needs sustained efforts to accelerate its achievements on the food and nutritional security front (GoI and WFP, 2019). A recent analysis of food and nutrition security status in India points out that during the period from 1993-94 to 2011-12, the average daily per capita consumption of both energy and protein decreased in rural India, while there was no consistent trend in urban areas (ibid, 2019). The Public Distribution System (PDS) started soon after independence, the Mid-Day meal scheme initiated during the 1960s in Tamil Nadu that spread to more States during the 1980s and 1990s, and the Integrated Child Development Services (ICDS) started during the 1970s were the major nationwide schemes to address this problem. There has been a focused attempt by the GoI as well as the State governments through various programmes and policies to address the issue of malnutrition in India, specifically among women and children (FN). However, despite the implementation of these programmes, policies and schemes aimed at ensuring food and nutritional security of the population, a significant share of the population (particularly women and children) suffers from malnutrition.

Nearly 60 per cent of the rural population of the country is dependent on agriculture and allied sectors for their livelihood. There exist a strong linkage (direct and indirect) between farming systems in rural areas and the nutritional status of the population that depends on it. Hence, identifying the issues around Farming System Nutrition (FSN) linkages, its constraints and the potential in realising better nutritional outcomes is crucial for achieving nutritional security.

In developing countries like India, demand-side and supply-side factors contribute to accomplishing better nutritional outcomes for its population. The major demand-side factors that contribute to nutritional outcomes are a) awareness levels of the population on the importance of nutrition and its determinants, b) purchasing power of the population to achieve better nutritional status, and c) socio-economic status of the population that influence access to and utilisation of nutritious food. Among various supply-side factors, the most important ones that influence nutritional outcomes are a) availability of diverse and nutritious food, and b) enabling environment in terms of water quality, care practices, disease burden, sanitation and health. The overarching policy framework that governs the demand and supply-side factors also plays a major role. Several gaps exist in the demand and supply-side factors that determine the effectiveness of various programmes and policy measures implemented to improve the population's nutritional status. We have made significant efforts in the case of supply-side factors governing nutritional outcomes (primarily through food and nutritional security schemes like PDS, Mid-Day Meal scheme and ICDS). However, our efforts in influencing demand-side factors that determine nutritional status are not enough to address the herculean task of bringing down malnutrition levels. Hence, any measure to address nutritional backwardness should focus on improving the demand-side factors as well.

Several scholarly studies have identified the pathways through which farming system nutrition linkages can contribute to nutritional security and have developed a farming system nutrition framework for better nutritional outcomes (Gillespie, S., Harris, J., & Kadiyala, S., 2012; Das et al., 2014). However, their analysis falls short of developing a policy framework, and identifying a development pathway that integrates the identified farming system nutrition linkages with large-scale social and nutrition security programmes. Such linkages between supply and demand-side factors alone can improve the nutritional status. These multisectoral (agricultural production, processing, marketing and distribution) activities need appropriate institutions to channelise the efforts towards improving the nutritional status of the population in the right direction. This study attempts to develop a model that integrates the demand and supply-side determinants of nutritional outcomes by adopting an inclusive and sustainable nutrition value chain approach. The model will use the potential of FSN linkages, and bring synergy between supply and demand-side factors for better nutritional outcomes.

The focus of this study is primarily to identify the issues, constraints and challenges in interventions based on the farming system nutrition framework in order to improve the nutritional status of rural population. After identifying the issues and challenges, the study

attempts to develop a framework and model that integrates the FSN approach with the ongoing programmes to provide nutritional security.

2. REVIEW OF LITERATURE

In India, the nutritional status of the population is dismal and worse than many countries, which are poorer and at low levels of economic growth and development. The National Family Health Survey-4 reports that 41.2 per cent of children under the age of 5 years in rural areas are stunted, 38.3 per cent in the same age group are underweight, and 21. 5 per cent of children are wasted (Government of India, 2017). Almost 60 per cent of children in the age group 6-59 months and 52 per cent of women in the age group 15-49 are anaemic. Also, 27 per cent of rural women and 23 per cent of rural men of the age group 15-49 years have BMI below normal levels. Malnutrition in all its forms imposes an unacceptably high burden on society and contributes to one-third to one-half of child deaths (Government of India, 2009). It is estimated that the annual economic losses due to malnutrition is about 3 per cent of India's Gross Domestic Product (Rainer, G., Hans, S., Hans, P., Hans-Joachim A.P., 2000).

Over the last few decades, Green Revolution technologies have improved the food availability situation in India, but improving availability alone will not result in food security. To ensure food security, availability, access and utilisation of food should be guaranteed. Utilisation includes absorption and bioavailability of food, which ensures nutritional security as well. This also necessitates that the rural population should have access to a healthy diet with a diversified food basket containing balanced foods providing adequate amounts of energy, fat, protein and micronutrients (Das et al., 2014). Therefore, agricultural and rural development interventions need to be more nutrition-sensitive, with a greater focus on nutrient-dense foods with high levels of bioavailability, i.e., the proportion of micronutrients capable of being absorbed by the body. Our achievements in production and productivity in agriculture enabled India to address calorie hunger, but hidden hunger caused by micronutrient deficiencies is widespread (Das et al., 2014). Since a large share of the rural population is dependent on agriculture for their livelihoods, the problem of malnutrition can be better addressed by adopting a strategy that incorporates farming system for the nutrition approach. Growth in the agriculture sector and improvements in returns from cultivation, if properly channelised through innovative institutional arrangements for developing nutritional value chains, can contribute to better nutritional outcomes by raising rural incomes. The Farming Systems for Nutrition (FSN) model proposed by Das, P.K., Bhavani,

R. V., & Swaminathan, M. S. (2014) aims at "providing 'agricultural remedies' to 'nutrition maladies'." The concept of the FSN model is that specially designed agricultural interventions with nutrition focus can enhance agricultural productivity and farm incomes, leading to more diversified and nutritive dietary patterns, resulting in better nutritional outcomes (Das et al., 2014).

The FSN model focuses on agricultural production and how to channelise the gains toward better nutritional outcomes directly and indirectly. However, it falls short of identifying various pathways through which the gains can be transferred in terms of better nutritional outcomes. Malnutrition is a multidimensional problem that requires multi-sectoral interventions. A complex interaction of food availability, food intake, water quality, care practices, disease burdens, sanitation and health services, as well as the deeper social, economic and political processes that drive these intermediate outcomes have an impact on nutrition (UNICEF, 1990). This requires an integrated approach in which agencies and institutions responsible for various sectors function synergistically by adopting a 'nutrition value chain approach' with improved coordination and common strategy (Henson, S., & Humphrey, J., 2015; Hawkes, C., & Ruel, M.T., 2011).

Along with these, it needs to integrate the supply-side efforts by the State as well as other public and private agencies with the demand-generating activities by adopting the nutrition value chain approach. A recent study on nutrition value chains in South Asia compares various pathways for nutritional transformation and warns about focusing on supply-side factors (primarily increasing supply of food) alone in current nutrition interventions. It emphasises the need to look into issues of distribution, and demand creation by improving livelihoods through a value chain approach (Maestre and Poole, 2018). Unless the production and productivity gains and improvements in food availability are translated into a sustainable system, where all actors along the nutritional value chains are incentivised to continue their participation and contribution, the gains from such initiatives will be short-lived.

The State is implementing a nationwide programme of Mid-Day Meal scheme with the primary objective of contributing to the nutritional well-being of school-going children and tackling the problem of high school dropout ratios in rural areas (Government of India, 2017). The programme spearheaded by the Department of School Education and Literacy under the Ministry of Human Resource Development has spent Rs. 10,000 crore during 2017-18 (GoI, 2017). India's Mid-Day Meal scheme is the largest school feeding programme globally, feeding over 100 million children daily (Sundaram, J.K., Rawal, V., & Clark, M.T, 2015). All the State governments

in India contribute to this programme and supplement them with their own activities to improve the participation and effectiveness of this initiative. This makes this programme best suitable platform for interventions aimed at improving the nutritional status of the vulnerable population. A better way of ensuring the sustainability of these programmes is to integrate this with the FSN concept. This necessitates the adoption of a nutrition value chain approach that links all the actors, processes and the value transaction (also nutritional gains and losses) that happens among various value chain actors.

Internationally, there are successful experiences that have adopted and implemented an integrated approach of linking the FSN framework with local agricultural production, consumption and distribution to achieve better nutritional outcomes. Brazil's food acquisition programme, Programade Aquisiçãode Alimentos (PAA), is one such successful programme. The unique feature of the programme was that, in addition to procurement of central food stocks for price stabilisation and food security, it also created marketing channels for local procurement of food through farmers' organisations and other local networks for sale to locally food-insecure populations in various ways. Carefully planned initiatives were taken to create opportunities for farmers to produce and sell vegetables, native fruits, grains, nuts, milk, and other nutritious food items. Food items procured from farmers through the PAA were supplied to food-insecure households as well as schools for their meal programmes (Grisa, C., & Schmitt, C.J., 2013; Peraci & Bittencourt., 2011; Silva et al., 2011; Soares et al., 2013; Swensson., 2015). This has created a lot of demand which had a multiplier effect on the local economy and savings in terms of avoiding the circular movement of food commodities. Along with this, it facilitated the creation of improved nutritional outcomes among the most vulnerable population.

Recently, few scholarly studies have addressed the issue of 'agriculture- nutrition disconnect' in India (Gillespie, S., Harris, J., & Kadiyala, S, 2012). Some attempted to develop a suitable framework to understand the dynamics of agriculture-nutrition linkages and prospective pathways to bring desirable nutrition outcomes (Gillespie et al., 2012). However, as mentioned earlier, their analysis falls short of developing a framework and identifying a development pathway that can integrate the identified farming system nutrition linkages with the supply and demand-side efforts. Integration of supply-side efforts for providing nutritional security - through large scale social security and nutrition security initiatives and programmes for improving rural health and sanitation - with demand-side efforts can result in sustainable solutions to nutritional problems. These multisectoral efforts need appropriate institutions to channelise efforts in the right direction.

3. OBJECTIVES OF THE STUDY

The major objectives of the study are the following:

1. To identify the issues, constraints and challenges in interventions based on the farming system nutrition framework to improve the nutritional status of rural population.
2. To develop a framework and model which integrates the FSN approach with the ongoing programmes to provide nutritional security through consultations with stakeholders along the nutritional value chains.
3. To improve the framework and model developed through feedback from consultations with stakeholders along the nutritional value chains and suggestions for its adaptability to specific nutritional challenges across various regions and socio-economic situations.

4. METHODOLOGY

4.1 Design of the Study

The study is designed to be carried out in three steps. The first step of the study was to review the existing body of knowledge, critically analyse the existing frameworks and identify the constraints and challenges. After reviewing the existing frameworks and identifying the constraints and challenges, a model development pathway that integrates FSN with nutritional security programmes is proposed. The model tried to integrate the demand and supply-side determinants of nutritional outcomes by adopting an inclusive and sustainable nutrition value chain approach.[1] The second step is to map and study the nutritional value chain in five States belonging to five geographic regions of the country. We adopted the value chain analysis methodology to understand the nutritional value chains and its specificities in each State. Along with the value chain analysis, specific attention was given to identifying the linkages of the value chain with the agricultural production systems in the State. This was mapped in the nutritional

[1] The concept of an inclusive and sustainable value chain approach has been adopted from FAO (2014), and has three major components. They are a) Economic Sustainability, b) Social sustainability, and c) Environmental Sustainability. Economic sustainability has elements of profit, employment generation, food supply and livelihoods. Social Sustainability looks at issues related to cultural tradition, distribution of surplus values, workers' rights and safety and the nature of institutions. Environmental sustainability includes elements of carbon footprint, water footprint, conservation measures, bio-diversity, food loss and waste and toxicity.

value chain, and we tried to identify the potential linkages and possibilities of integrating the farming systems with the existing nutritional value chains. Based on the nutritional value chain analysis, a model that integrates the farming system components with the ongoing nutritional components in the value chain is proposed. This model was then presented to the various stakeholders along with value chain in the study States and modified based on their evaluations and suggestions. The model can be further improved through consultations with key stakeholders engaged in making policies and programmes for better nutritional outcomes.

4.2 Analytical Framework

The study has adopted a nutrition value chain analysis framework to identify the various value chain actors and processes. This framework was used to map the nutritional value chain. The data and information regarding value chain actors for mapping the value chain were gathered through stakeholder consultations and discussions with value chain actors. The data and information for developing and validating the model was collected through institutional mapping and focus group discussions.

4.3 Study Area

The model was developed and improvised through stakeholder consultations. The consultations with stakeholders focused on institutional mapping and identifying their roles in linking FSN with the existing food and nutritional security programmes. The key stakeholders were farmers, marketing agents, various forms of women collectives, ICDS functionaries, educational institutions at the grassroots level, Panchayati Raj Institution (PRI) functionaries responsible for health, sanitation, education, rural infrastructure and agriculture and rural development at State, district, block and village levels.

The framework and model developed were for nationwide coverage. To ensure that the model addresses the specific nutritional challenges and farming system specificities of different regions, consultations were carried out with relevant stakeholders. The stakeholder consultation was carried out in five regions of the country. The study was carried out in the five States - Gujarat from the West (Central Malwa High lands), Chhattisgarh from Central India (Central Malwa Highlands), Odhisha from the East (Eastern Plateau), Telangana from South Central India (Deccan and the Eastern Ghats), and Kerala from the Southwest (West Coast Plains and Hills). The States were chosen based on a) their geographical location, which largely represents diverse agro-ecological conditions and agricultural production systems, b) nutritional status of its population, c) nature and characteristics of policies and programmes aimed at addressing

malnutrition, and d) specificities of the nutritional value chain in operation, particularly the institutional arrangement involved to facilitate agriculture- nutrition linkage.

5. NUTRITION PROFILE OF STATES STUDIED

The five States selected for analysis have distinct features in their regions regarding the nutritional status of women and children. They also represent diverse geographies, and agro-ecological regions with different agricultural production systems and are differently endowed with respect to its development indicators, specifically with respect to the literacy status of women. The most important indicators pertaining to health and nutritional status of women and children estimated by the National Family Health Survey during 2005-06 and 2015-16 are given in Table 1. This provides an idea about the nutritional status of the population in the States focused in the study as well as the trend in their progress regarding nutritional improvement programmes.

Table 1: Nutritional and Health Indicators of States Studied during 2005-06 and 2015-16

Indicator	Chhattisgarh		Odisha		Gujarat		Kerala		Telangana	India	
	NFHS 3	NFHS 4	NFHS 3	NFHS 4	NFHS 3	NFHS 4	NFHS 3	NFHS 4	NFHS 4	NFHS 3	NFHS 4
Infant mortality	71	56	69	43	58	39	14	5.4	38	62	46
Nutritional Status											
Stunted	55.7	39.2	46.5	35.3	54.8	42.9	25.6	19.5	33.3	47.2	41.2
Wasted	19.9	23.7	20.5	20.9	19.9	28.5	18.2	15.5	20.4	24.1	21.5
Underweight	50.22	39.6	42.3	35.8	47.9	44.2	26.4	16.7	33.1	43.7	38.3
ICDS Services (% of Children)											
Supplementarynutrition (0-71 months)	60.1	75.2	53.5	77.5	36.2	67.3	24.8	50.2	72.4	27.8	53
Immunisation	48.6	65.4	42.7	63.5	39.9	60.5	8.8	20.5	56.9	38.6	44.2
Health check-up	33.8	71.1	43.7	68.7	29.4	63.8	17.8	37.8	56.7	18.6	43.2
Pre-school (36-71)	38.5	58.7	28.2	63.2	43.7	60.6	30.7	38.73	55.7	24.4	42.3
Pregnant Women											
Supplementary nutrition	66.4	92	46	90.3	21	66.7	15.6	30	78.5	21.4	57.5
Health check-up	46	84.8	42.6	85.5	18.4	61.6	10.2	19.5	62.1	13	47.4
Lactating mothers											
Supplementary nutrition	65.1	91	41	87.1	13.8	59.4	10	24	74.7	17.3	53.1
health check-up	28	75.6	28.9	81.2	9.4	53.3	5.6	15.3	58.5	9	40.5
Vitamin A supplement given											
% of children aged 9-59 months	8	69.8	21.6	68.7	15.6	72.5	36.5	75.8	77.2	17.5	59.1
Anaemia											
% of children aged 6-59 months	72	41.2	66.6	45.7	74.6	64.6	44.6	37.7	67.5	71.5	59.5
Source: National Family Health Survey 3 during 2005-06 and National Family Health Survey 4 during 2015-16											

5.1 Kerala

The State of Kerala has the distinction of having the lowest malnutrition levels in the country. It also has higher levels of literacy levels in general, and specifically for females. Another characteristic that has significantly contributed to the achievements on the nutritional front is the presence of strong decentralised institutions of governance and well-organised women collectives in the form of SHGs under the leadership of the State Livelihoods Mission (Kudumbashree). These factors have made substantial contributions to the efforts to address the malnutrition problems of the State. Hence, it is vital to understand the nutritional value chain in the State to assess the characteristics desirable for a sustainable and replicable model of agriculture-nutrition linkages. It will also help to understand the role of PRI institutions in effectively implementing and monitoring nutrition programmes in the State.

5.1.1 Nutritional and Health Status of Population in Kerala

5.1.2 Child Mortality in Kerala

Kerala had the lowest infant mortality rate among all the study States. In 2005-06, rural Kerala had just 14 deaths per 1000 live births among children below 1 year and further declined to about 5 deaths per 1000 live births in 2015-16, as opposed to 46 deaths per 1000 live births on average in rural India in 2015-16.

5.1.3 Nutritional Status of Children in Kerala

The nutritional status of children in rural Kerala also suggests relatively better child health than in rural India and other study States. About one-fourth (25 per cent) of the child population under five years of age were stunted or underweight, and only 18 per cent of them were wasted in 2005-06. The nutritional status of children further improved in rural Kerala by 2015- 16, with only one-fifth (20 per cent) of the child population stunted and just 15 per cent of them wasted or underweight, whereas about two-fifths of the child population are stunted and underweight in rural India.

5.1.4 ICDS scheme for Children in Kerala

In rural Kerala, the coverage of ICDS scheme is not as extensive as in other States. Only about 25 per cent of children aged 0 to 71 months received supplementary nutrition in 2005-06 from anganwadi centre, which doubled in 10 years, covering 50 per cent of the child population,

close to the coverage in rural India (53 per cent). Similarly, immunisation care and health check-ups, which covered 9 per cent and 18 per cent of children under AWCs in 2005-06, doubled to 21 per cent and 38 per cent in 2015-16, respectively.

Pre-school or early childhood care to children aged 3 to 5 years in rural Kerala improved only marginally from 31 per cent in 2005-06 to only 39 per cent in 2015-16, whereas in overall rural India, 42 per cent of children receive pre-schooling or early childhood care.

5.1.5 ICDS scheme for pregnant women and lactating mothers in Kerala

The provision of supplementary nutrients and health check-ups to pregnant women and lactating mothers under ICDS scheme is very low in Kerala. Supplementary nutrients and health check-ups to pregnant women were only provided to 16 per cent and 10 per cent of births, respectively, in 2005-06, which doubled in 2015-16, providing to 30 per cent and 20 per cent of births. However, the coverage is still 30 percentage point lower than the average rural coverage. Similarly, although there is an improvement in providing supplementary nutrients and health check-ups to lactating mothers, still it is short of the average coverage in rural India. A major reason for the low coverage of provision of supplementary nutrients and health check-ups through anganwadis does not necessarily imply the poor health and nutritional status of the population in Kerala. The purchasing power and standard of living of an average household in Kerala are much better than any rural household in any other part of India. This makes them less dependent on public provisioning of these services, and hence the low coverage. The households have the capability to afford them through private players.

5.1.6 Vitamin A supplement and Anaemia in Kerala

In rural Kerala, provision of Vitamin A supplements in the six months preceding the survey plummeted from an already high 37 per cent of children aged six months to 59 months in 2005-06 to 76 per cent of children aged nine months to 59 months in 2015-16, which is otherwise provided to 60 per cent of children in overall rural India in 2015-16.

Only 45 per cent of children were found to be anaemic in rural India in 2005-06, as opposed to 72 per cent of children. Further, the incidence of anaemia was reduced by six percentage point in rural Kerala, in contrast to the 10 percentage point drop in rural India but still with the least proportion of children with anaemia among all the study States (38 per cent of children with anaemia).

Surprisingly, even though the ICDS coverage for both children and mothers is very low in

rural Kerala, the health status of children - in terms of their nutritional status and even the low prevalence of anaemia- is much better than any other State in India.

5.2 Nutritional Value Chain in Kerala

This section describes the nutritional value chain in the State of Kerala. We will explain the value chain and then describe the major activities of various value chain actors at multiple levels. The nutrition value chain in Kerala primarily operates at three levels:

a. The policies and programmes are formulated, and coordination of activities is carried out at the State level by the Women and Child Development Department in coordination with the departments of Health and Family Welfare, Education and Local Self Government.

b. The activities focusing on nutrition and food security are coordinated at the district level by the district offices of relevant departments. These activities are implemented by respective departments and coordinated by the District Collector.

c. At the grassroots level, anganwadis are the basic institutions that act as a platform, coordinated and supported by the Gram Panchayat, which hosts and coordinates all the activities of various agencies engaged in implementing various components related to programmes for food and nutrition security. They integrate the activities of the departments of Women and Child Development, Health and Family Welfare and Local Self Government.

The most notable feature of the entire nutrition value chain in Kerala is the involvement of institutions of local self-governance (LSGs) in coordinating and taking an active role in the implementation of the nutrition improvement programmes at various levels. They serve as a platform that anchors the convergence functions among various stakeholders. A major limitation is the absence of any linkage and integration with the Department of Agriculture Development and Farmer's Welfare. Any linkage between agriculture production systems and nutrition programmes needs to have a strong linkage and convergence with the Department of Agriculture and Farmer's Welfare. This is currently lacking in this value chain.

The nutritional value chain in the State is represented in Figure 1.

5.2.1 Value Chain Actors at the State Level

At the State level, the policies and programmes are formulated, and coordination of

activities is carried out by the Women and Child Development Department in coordination with the departments of Health and Family Welfare, Education and Local Self Government. The Department of Women and Child Development has the primary function of implementing the programmes and policies aimed at improving the nutritional status of women and children in the State. They are primarily responsible for implementing, monitoring, formulating policies, and administering various activities focusing on food and nutrition security. Several direct and indirect factors contribute to food and nutrition security. The direct factors are availability and access to food, whereas indirect factors are aspects related to the utilisation of food, factors influencing the disease burden of the population like the status of availability of good quality and safe drinking water, hygiene and sanitation. These components are implemented by the Department of Health and Department of Local Self Government through its agencies of governance. They perform these functions through the district functionaries of the respective departments, which the District Collector coordinates at the district level.

5.2.2 Value Chain Actors at the Grassroots Level

Kerala has a history of powerful decentralised institutions of governance at the grassroots level. Several key powers of various departments have already been devolved to the Panchayati Raj Institutions, which are local governance institutions at the grassroots level. This has empowered the PRIs with the powers and functions required for efficient implementation of various programmes and ensured that the activities are participatory and inclusive in nature.

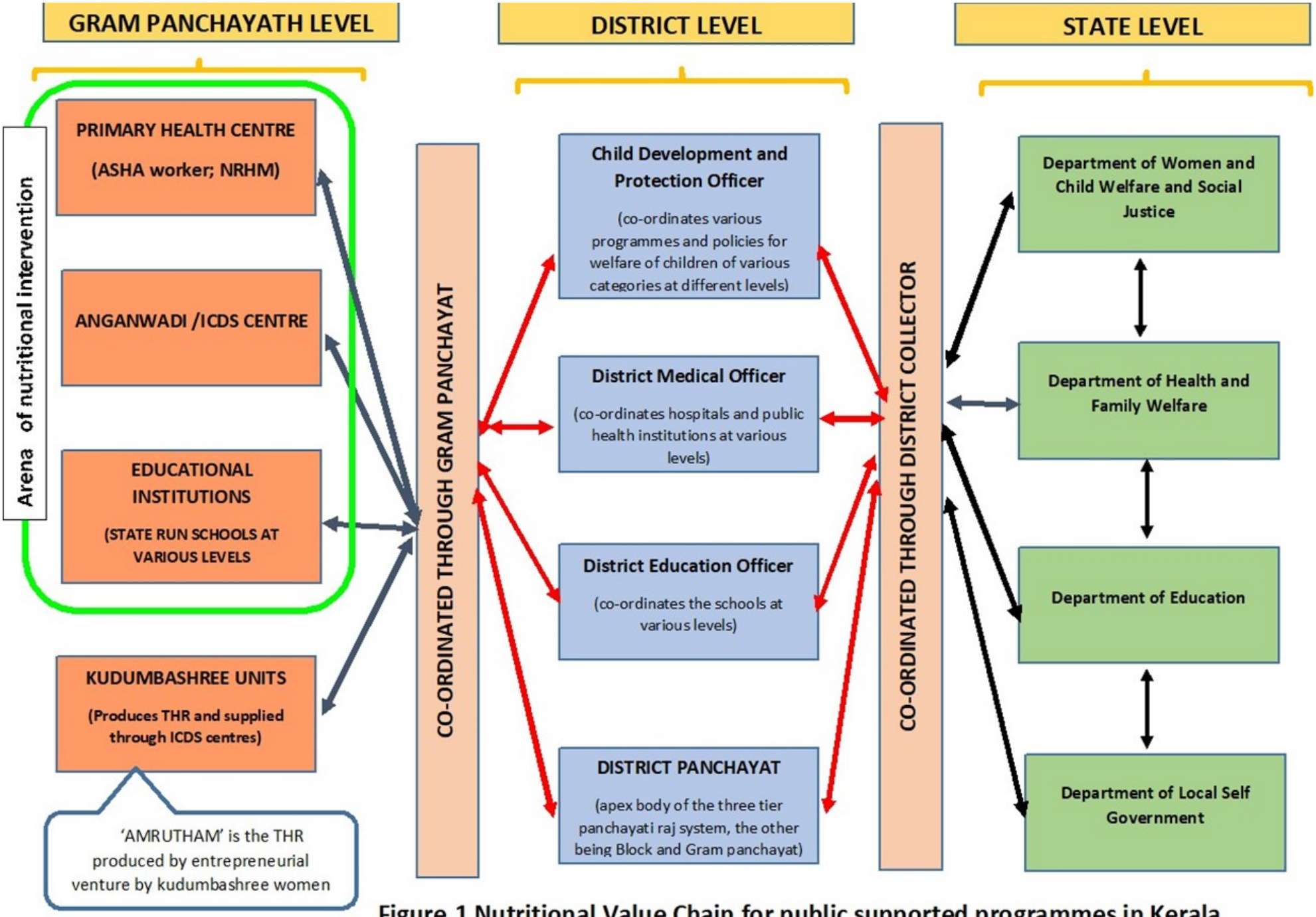

Figure.1 Nutritional Value Chain for public supported programmes in Kerala

At the grassroots level, Panchayats are responsible for coordinating the functions of various departments engaged in the food and nutrition security of the population. They also have powers to monitor and take necessary steps to ensure coordination and integration among the various institutions in the village. The anganwadi centres are a setup based on population norms[2] in each village and are managed by anganwadi workers and anganwadi helpers. They are employees of the Department of Women and Child Development. Health services like vaccination and vitamin supplements are provided by ANMs of the Department of Health and Family Welfare. They are supported by various professionals, including doctors and paramedical staff, in cases requiring medical attention. The local bodies (PRIs) in which anganwadis are located monitor their functioning through various bodies, which have representatives from various government departments, local bodies, elected representatives of various tiers of PRIs, parents and women welfare bodies. A group of anganwadis are supervised by the anganwadi supervisor, mostly at the block level. They are again coordinated and supervised by CDPOs and Child Welfare Officers at the district level.

The anganwadis at the grassroots level support the nutritional requirement of children up to three years, pregnant women and lactating mothers. Major support is by providing a nutritious, balanced diet, supplementary nutrition, necessary vaccinations, health advisories, knowledge and information regarding best and healthy practices for achieving better nutritional status for the community. The anganwadi staff undertake periodical household and individual surveys to collect data and information about the socio-economic, demographic, health and nutritional status of the population under their jurisdiction, particularly women and children. Based on the data and information collected, they formulate intervention strategies to improve their nutritional status by providing balanced food, take-home rations, vitamin supplements, proper and timely vaccinations and nutrition education. The provisions are arranged with the support of the Public Distribution System, a few private vendors and traders, entrepreneurial ventures of SHGs or other women federations. Self-help group women organised through Kudumbashree have established micro-enterprises to produce Amrutham, the nutrimix provided as Take-Home Ration (THR), which is provided once a fortnight to children aged 6 months to 3 years. Their supply chain is largely dependent on the Public Distribution System, Food Corporation of India, and private vendors and traders. The existing value chain has very weak linkages with the local agricultural production system and is heavily focused on maintaining supply chain elements.

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[2] One Anganwadi centre for 400 – 800 population.

The range of activities handled by the anganwadis towards achieving better nutritional outcomes requires a significant amount of convergence among various departments responsible for various components. A more considerable integration function is performed by PRIs, which are the grassroots level institutions of governance. As there has been a relatively better divergence of power among these institutions through several decentralisation campaigns, they have played a key role in improving the efficiency of implementation of programmes that focus on the improvement of nutritional status of the community.

At present, there are 242 units of Kudumbashree with a turnover of Rs. 100 crore in the State that produces THR and supplies to the ICDS programme. These units are run by Kudumbashree women who are organised into SHGs comprising 11-15 members in each unit. Each unit caters to the requirement of four Gram Panchayats. The THR produced by the Kudumbashree units in the State is named 'Amrutham'. The ingredients and their composition were designed, tested and recommended by competent professionals at the Central Plantation Crops Research Institute, Kasaragod, Kerala. The ingredients of THR are wheat, sugar, Bengal gram, groundnut and soya bean. They are planning to fortify this mix with micronutrient supplements. The technical parameters, quality and food safety parameters are taken care of by the Government Medical College, Kozhikode. This is being given to children in the age group of six months to three years, pregnant and lactating mothers, and in certain cases, to the elderly population in select areas. In Wayanad district, each child belonging to the eligible age group is given 3.5 kilograms of Amrutham for a month. This is distributed to the beneficiaries once or twice a month. The Gram Panchayats provide the funds for provision of THR to the beneficiary population through allocations made in its annual budget. The SHGs sell the intended quantity of THR packets to the Gram Panchayat and get their payment. Among the ingredients used for producing THR, wheat is provided by the ICDS programme to the SHGs from the Food Corporation of India, which is the mandatory allocation to the programme at subsidised prices. Other ingredients are procured by the SHGs from the open market and are used for production. The production unit is mechanised and human intervention in the production process is kept minimal to avoid contamination and maintain hygiene and food safety standards. Kudumbashree supports the establishment of the THR producing units, helps them avail credit for establishing the unit, conducting periodic capacity building for producing THR, maintaining food safety standards in production, transporting and storage, and getting necessary regulatory approvals for the functioning of such units. All the units have licences from the local body and relevant agencies, FSSAI registration and are GST compliant. The members of the SHG have taken credit from Cooperative Bank for establishing the unit, and they are repaying the credit

taken from the sale of produce in the unit. In addition to THR production, certain units are engaged in the production of value-added food products during lean periods, particularly after meeting the production requirements of the ICDS centres in their jurisdiction. On average, each member of the unit gets a net income of Rs. 15,000 per person per month from the unit.

5.3 Case of Sneha SHG, Vellamunda

We present a case study of Sneha, an SHG initiative by Kudumbashree in Vellamunda Panchayat of Wayanad district. This is the only district from Kerala that falls on the list of 'Aspirational Districts' identified by the Government of India. This unit was started in 2006 by combining three SHG units by Kudumbashree, who imparted them eight days of training in establishing a THR unit and production process. The unit did not have sufficient machinery for producing THR, according to the demand of the Gram Panchayat. Hence, during the initial period, they were availing the facility of a private flour mill for grinding the ingredients and producing the THR for sale to ICDS centres. Later, the members of the unit contributed Rs. 35,000 each (contributing a total of Rs. 3,85,000) to mobilise the capital. Besides, they took a credit of Rs. six lakh from the Cooperative Bank. At present, the unit is functioning well and has reached a breakeven point and has to repay the credit from the cooperative bank. This unit is selected as a pilot project in the State to produce fortified THR by adding micronutrients to the produce during production itself. All the members have got training in this and are equipped with machinery. Once they start producing micronutrient-enriched THR, this will become a good model of integrating local entrepreneurship with the ongoing nutrition improvement programmes that promote women empowerment and creation of livelihoods for them.

However, a major shortcoming is the absence of any integration with the local farming system, which questions its sustainability.

5.4 Issues and Challenges

The major issue faced by the nutritional value chain in Kerala is that the interventions and the linkages are focused largely on the supply-side factors. In the nutritional value chain, there is no significant linkage of the nutrition promotion programmes or the value chain actors with the agricultural production systems at any point of the chain. The major programmes focusing on nutritional improvements (ICDS programme and Mid-Day Meal scheme) have very weak or no

linkage with the agricultural production systems of the State. In the case of THR produced and supplied through ICDS centres, none of the ingredients are neither produced nor procured from agricultural production in the region or within the State. Similar is the case with the Mid-Day Meal scheme at the schools in the State. This is a major issue that can affect the sustainability of nutrition interventions in the long run.

5.5 Potential

The most significant advantage of the nutritional value chain in Kerala is its decentralised institutions of governance, which provide a platform for inclusiveness as well as promoting convergence. This can be leveraged to create institutions that help address the issues and challenges by creating better agriculture nutrition linkages. The existing local agriculture production systems can be better linked to the nutrition programmes, thus contributing to its sustainability. The first step towards this is to support the local agricultural production system to provide supplies to the Mid-Day Meal scheme in schools under the jurisdiction of the respective Gram Panchayats. This can support the livelihoods of local population dependent on agriculture and infuse purchasing power into their hands. These will, in turn, contribute to improved food intake, dietary diversity, and enhanced food safety measures and result in the establishment of a sustainable agricultural nutrition linkage for the better nutritional outcome.

5.6 Model Farming System for Nutrition: Sustainability and Replicability

The model FSN can be formed by creating an institutional mechanism that crafts a linkage between the existing farming system and the ongoing efforts to bring out better nutritional outcomes. This will, to an extent, address the issue of less emphasis on demand-side factors in the current nutritional value chain.

The existing mechanism of empowering Kudumbashree units to manufacture and provide THR to the target population through ICDS centres is noteworthy in terms of empowering women through the creation of entrepreneurial ventures to support nutrition programmes. This will improve their livelihoods, enhance their purchasing power and standard of living and at the same time, contributes to address malnutrition in the society. However, the existing institutional arrangements have one major limitation. It is in no way linked with the local agricultural production systems and has less scope in its present form to establish linkages that can impart

sustainability and replicability to such initiatives. Considerable efforts are needed to establish such linkages to improve the sustainability of the programmes. Kerala demonstrates a case of addressing nutritional challenges through the creation of institutions which are public-supported initiatives interlaced with people's action. The establishment of linkages with the local agricultural production systems can take this to further levels of effective and sustainable strategies to tackle nutritional challenges.

6. GUJARAT

6.1 Nutritional and Health Status of Population in Gujarat

6.1.1 Child Mortality in Gujarat

In rural Gujarat, the infant mortality rate is lower than the average in rural India, both in NFHS-3 and NFHS-4. There were about 58 deaths per 1000 live births among children below a year in 2005-06 and declined to 39 deaths per 1000 live births in 2015-16, as opposed to 62 and 46 deaths per 1000 live births in rural India, in 2005-06 and 2015-16, respectively.

6.1. 2 Nutritional Status of Children in Gujarat

Stunted, wasted and underweight child (3 to 5 years) population is quite high in rural Gujarat, more than the average child population with poor nutritional status in rural India. According to NFHS-3 data, more than half (54 per cent) of the child population were stunted (short for their age), one-fifth (about 20 per cent) of them were wasted (thin for their height), and half (48 per cent) of them were underweight (thin for their age) in rural Gujarat. By 2015-16 (NFHS-4), the stunted and underweight child population declined to about 43 and 44 per cent of the child population, respectively. However, the wasted child population increased by about 10 percentage point from 20 per cent in 2005-06 to 29 per cent in 2015-16. Pre-schooling or early childhood care increased from two-fifths (about 40 per cent) of the child population aged 3 to 5 years in 2005-06 to three-fifth (about 60 per cent) of the child population in 2015-16, as opposed to 42 per cent of children receiving pre-schooling or early childhood care in overall rural India in 2015-16.

6.1.3 ICDS Scheme to Children in Gujarat

Rural Gujarat showed a significant improvement in ICDS coverage of supplementary nutrition, immunisation care and health check-ups for children aged 0 to 71 months. There is a 30

percentage point increase in the coverage of children to receive supplementary nutrition and health check-ups and a 20 percentage point improvement in immunisation care in 2015- 16 from 2005-06. The pace of increase in ICDS coverage for children does not vary from that in rural India. However, in rural Gujarat, the ICDS scheme covers almost three-fifths (about 60 per cent) of the child population (0-71 months) as opposed to only two-fifths (40 per cent) in rural India, according to the latest NFHS data (2015-16).

Similarly, early childhood care or pre-school in rural Gujarat has increased from 44 per cent of 3 to 5-year-old children in 2005-06 to 61 per cent in 2015-16, i.e., about 20 percentage point more than that of the average child population covered in rural India (42 per cent received pre-school in rural in 2015-16).

6.1.4 ICDS Scheme for Pregnant Women and Lactating Mothers in Gujarat

The ICDS coverage, which is a provision of supplementary nutrition and health check-ups to pregnant women in rural Gujarat, was as low as about 21 per cent and 18 per cent of births, respectively, in 2005-06, and that to the lactating mothers were even worse at 14 percentage and nine percentage of births, respectively. By 2015-16, there was a remarkable improvement by about 40 percentage point, taking the coverage of supplementary nutrition and health check-ups to more than 60 per cent of pregnant women and about 55 per cent of lactating mothers.

6.1.5. Vitamin A supplement and Anaemia in Gujarat

Vitamin A supplements to pre-school children to control child morbidity and mortality were received by about 16 per cent of children aged 6 to 59 months in rural Gujarat, in the period of six months preceding the 2005-06 survey, as opposed to about 18 per cent in rural India. In rural Gujarat, eventually, the provision of Vitamin A supplement improved by 2015- 16, covering about 73 per cent of children aged 9 to 59 months, whereas in rural India, only 59 per cent of them received vitamin A supplements.

According to NFHS-3, in 2005-06, about three-fourths (75 per cent) of the children aged 6 to 59 months were anaemic, which was marginally reduced by 10 percentage point in 10 years, with about 65 per cent of children still anaemic in 2015-16.

The landscape of policies and programmes to address nutritional challenges in the State of Gujarat is laid out by the Departments of Women and Child Welfare, Health and Family Welfare, Education, Rural Development, Food Civil Supplies and Consumer Affairs, and Panchayats and Rural Housing Department. The Department of Women and Child Welfare is responsible for

implementing the ICDS programme, Department of Health and Family Welfare implements the RMNCH +A programme (which focuses on Reproductive, Maternal, Newborn, Childhood and Adolescent Health), Department of Education implements the Mid-Day Meal Programme, and the Department of Rural Development steers programmes to improve rural sanitation and hygiene. These programmes lay out the platform for the implementation of strategies to address the nutritional challenges of the State.

The nutritional value chain in Gujarat primarily operates at two levels, at the State level by the Departments of Women and Child Welfare, Health and Family Welfare, Education, Rural Development, Food Civil Supplies and Consumer Affairs, and Panchayats and Rural Housing Department. The second layer operates at the district level, with the District Collector coordinating the implementation of flagship programmes of these Departments. Recently, the Gujarat State Rural Livelihood Mission has started its interventions through women SHGs in select districts. This is an appreciable effort towards ensuring inclusiveness and sustainability of programmes for improving nutritional status of the population.

6.2 Nutritional Value Chain in Gujarat

As described in the previous section, the programmes for nutritional challenges in the State have a two-layered structure. At the State level, the most important programmes aimed at improving nutritional status of the population are implemented by the Department of Women and Child Development (ICDS), Department of Health and Family Welfare (Immunisation and Public Health and RMNCH+A), Department of Education (Mid-Day Meal Scheme) and Rural Development Department (MANGALAM as part of GSRLM). These departments in the State carry out all the significant policies and programmes aimed at addressing nutrition challenges. At the next level of the nutritional value chain are the institutions of these departments at the district level, which is coordinated by District Collectors of respective districts. The district-level functionaries of these departments are responsible for implementing the programmes at various administrative levels within the districts, starting at the district level, taluk level, block-level and Gram Panchayat level. In Gujarat, major activities occur at the State and district levels. The district-level activities are further implemented by the respective line departments further down at the block level and the Gram Panchayat level. The detailed nutritional value chain in the State of Gujarat is given in Figure 2. Like in other States, certain initiatives in creating institutional innovations have resulted in improving the inclusiveness and sustainability of the ongoing

programmes to meet the nutritional challenges. This has been made possible by the convergent initiatives of the line departments and livelihood mission in the State. This is discussed in the following sections.

6.2.1 ICDS Scheme in Gujarat

The ICDS programme in Gujarat symbolises the State's commitment to its children towards a holistic approach to child health, nutrition and development. The scheme is currently operational through 53,029 Anganwadi centres in 336 blocks. The major objectives of the scheme as envisaged by the State government are

a. To improve the nutritional and health status of children in the age group of 0-6 years.

b. To lay the foundation for proper psychological, physical and social development of the child.

c. To reduce the incidence of mortality, malnutrition and school dropout.

d. To achieve effective coordination of policy and implementation amongst the various departments to promote child development, and

e. To enhance the capability of the mother to look after the normal health and nutritional need of the child through proper nutrition and health education

The Supplementary Nutrition Programme in Gujarat specifically focuses on addressing the State-specific nutritional problems of the women, children and adolescent girls. The scheme has State-specific characteristics reflected in the nature, composition, and schedule of nutritious food given to the target population (women, children, and adolescent girls). With a view to combating malnutrition among children under six years, pregnant women, lactating mothers and adolescent girls, the State government is implementing this nutrition programme. Supplementary nutrition equivalent to 500 calories and 12-15 gram protein is provided to normal children under six years, and 800 calories and 20-25 gram protein to severely underweight children under six years. Pregnant women, lactating mothers and adolescent girls are given SNP food that provides 600 calories and 18-20 gram of protein. Approximately 51.79 lakh beneficiaries are covered in supplementary nutrition programme. Among them, 32.30 lakh are children belonging to 6 months to 6 years age group, 11.61 lakh adolescent girls and 7.74 lakh pregnant & lactating women. Six major categories of food are given as part of this supplementary nutrition programme in Gujarat. They are

Balbhog: This is an Energy Dense Micronutrient Fortified Extruded Blended Food (Balbhog)

which is provided as Take-Home Ration (THR) to normal children aged 6 months to 3 years (7 packets per month, i.e., 3.5 kg), severe underweight children aged 6 months to 3 years (10 packets per month, i.e., 5 kg), and severely underweight children 3-6 years (4 packets per month, i.e., 2kg) on Mamta Diwas. Each packet weighs 500 gms. The shelf life of these premixes is four months. The food can be easily prepared by mixing it with hot milk or water. Approximately, 17.95 lakh children in age group of 6 months to 3 years, and 14.48 lakh children aged three years to six years are receiving Balbhog as Take-Home Ration.

Extruded Fortified Blended Premix: Dense Micronutrient Fortified Extruded Blended Take-Home Ration (THR) like Sukhadi (1 packet of 1 kg per month), Sheera (3 packets of 500 gm each) and Upma (2 packets of 500 gm each) are provided to pregnant women, lactating mothers and adolescent girls. Nearly 7.74 lakh pregnant and lactating mothers and 11.61 lakh adolescent girls received THR in 2016 (as per the ICDS MPR).

Demonstrative Feeding: In order to create awareness and improve the consumption of supplementary nutrition among children of 6 months to 3 years and provide age-appropriate nutrition counselling to mothers, State Government has introduced demonstrative feeding for 6 months to 3-year-old children. Demonstrative feeding is given to children at AWCs through their parent/guardians from 9:30 AM to 10:30 AM. Younger children aged 6 months to 1 year are given 'Raab' (in semi-liquid form), and older children 1-3 years are given 'Sukhadi', which is prepared by mixing jaggery to THR- Balbhog.

Breakfast by SHGs: Hot cooked breakfast is provided to children in the age group of 3-6 years through SHGs. These organisations are involved in the Supplementary Nutrition Programme to promote community participation to create awareness, and monitor and maintain the quality of food. They prepare and provide the supplementary food to the beneficiaries at the anganwadi centres for six days a week.

Hot Cooked Afternoon Meal: As part of this programme, 80 grams of freshly prepared hot cooked meal within a limit of Rs. 3 per day per beneficiary is prepared by AWW and AWHs and provided to 3 to 6-year-old children at the AWCs. In order to fortify the meal with protein, toor dal, chana, etc., are incorporated into the menu of AWCs. The Gujarat State Civil Supplies Corporation provides whole wheat, rice, and oil to prepare the afternoon meal. Besides, there is a provision of funds to add Bengal gram whole or Toor dal, green leafy vegetables, groundnut or til, jaggery, spices, etc., to be included in the recipe by procuring through local purchase.

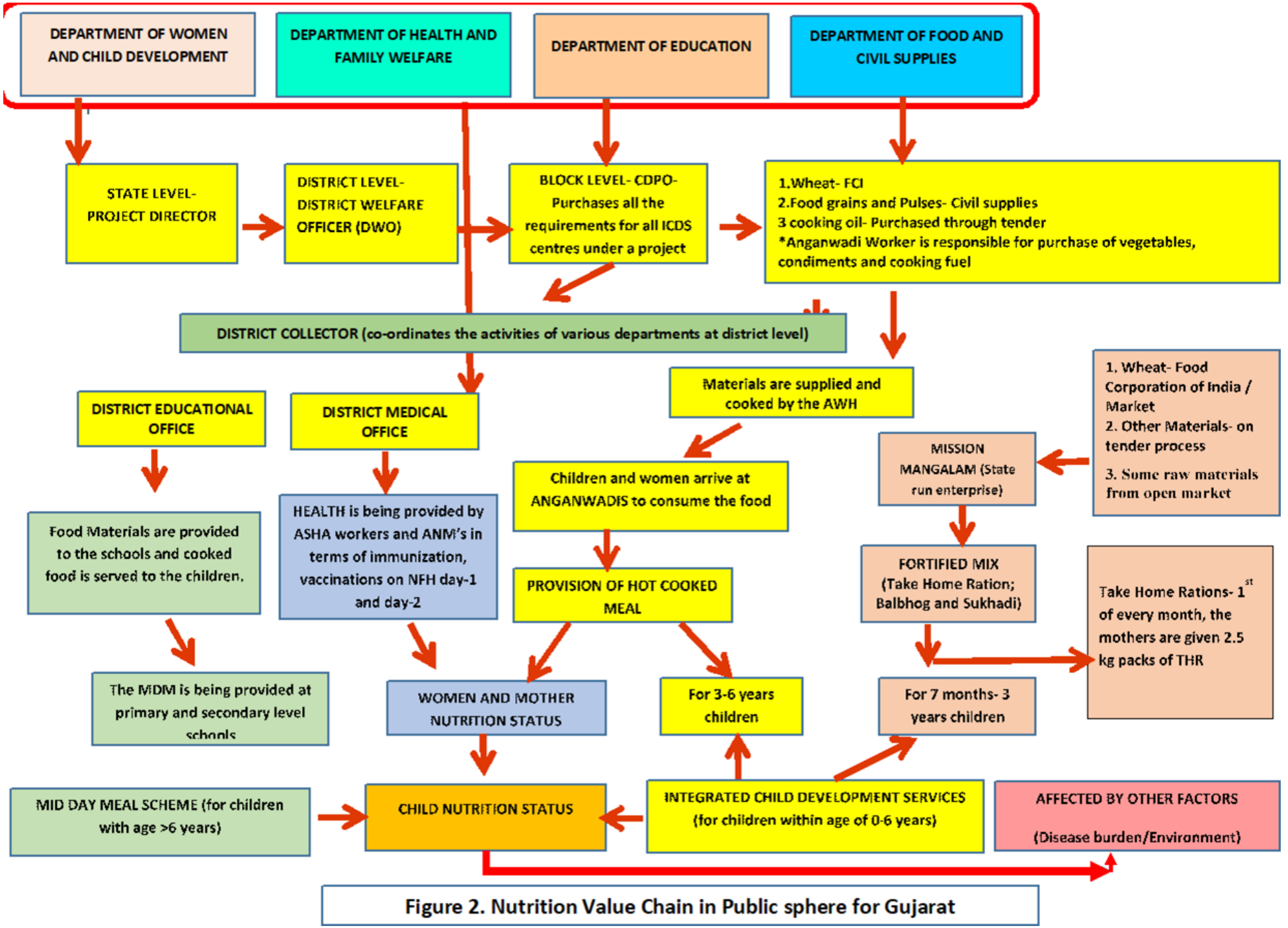

Figure 2. Nutrition Value Chain in Public sphere for Gujarat

Third Meal: A Third Meal' as 'Carry Away Meal' is given in the form of laddu to moderate and severely underweight children among 3-6 years. The third meal would have a shelf-life of at least two days so that child can consume it at any time after going home. This is prepared and provided through Gram Panchayat by selected Self Help Groups.

Doodh Sanjeevani Yojana: This is another initiative of the State in selected 10 Blocks of 6 Tribal districts, wherein 100 ml fortified, flavoured, double toned pasteurised milk is provided to children 3-6 years, twice a week (Tuesday and Friday). This was later extended to children aged 6 months to 3 years, 200ml milk to children aged 3-6 years, pregnant and lactating women at AWCs. At present, children aged 6 months to 6 years are provided 100ml flavoured milk five days a week and pregnant and lactating mothers are given 200ml flavoured milk twice a week. In the year 2016- 17, a total of 11,65,757 beneficiaries were covered under Doodh Sanjeevani Yojna through 16170 Anganwadis centres. This initiative is being implemented with the help of Cooperative Dairies.

Fruit through SHGs: The State government also provides fruits (seasonal) to children in the age group of 3-6 years twice a week (Monday and Thursday) at the anganwadi centres. A provision of Rs.20 per month per child is made under the State budget.

Sukhadi (THR): As part of the efforts to improve the nutritional status of the population, pregnant women, lactating mothers and adolescent girls are being provided freshly prepared 'Sukhadi" (desi sweet prepared with wheat flour, oil and jaggery) as Take-Home Ration through SHGs.

As discussed in the previous section, though the major nutrition-focused programmes operate at two tiers, some have been implemented by involving women SHGs and institutions of Local Self Government. A review of the ongoing programmes reveals the potential for greater linkages with grassroots-level institutions like PRIs and women SHGs engaged in livelihood improvement activities. The SHGs are carrying out certain striking initiatives with the support of GSRLM in some districts of the State. They are discussed in the following sections.

6.2.2 Take-Home Ration (THR) Production Initiative in Amreli District

The objective of this initiative was to organise the production of Take-Home Ration (THR) kits for distribution through ICDS centres by Village Organisations (VOs) in that area to ICDS beneficiaries and their families. The major objectives of the project are

1. To provide healthy, nutritious supplementary food to children aged 6 months to 3 years,

lactating mothers, pregnant women and adolescent girls regularly of Kukavav block.

2. To improve the health status of women, children and adolescent girls through the preparation and supply of supplementary food like Balbhog and Shukhadi.

3. Empower SHG/VO women through income-generation activities and bring change in the health status of women and children

The ingredients of THR kit are wheat, Bengal gram, soya bean, jaggery, groundnut oil and micronutrients in specified proportions. The unit is designed to make Balbhog given to children, and Sukhadi given to pregnant women, lactating mothers, and adolescent girls. The programme is planned to distribute seven packets (500 g each) of Balbhog to children and one kilogram of Sukhadi for pregnant and lactating mothers and adolescent girls in a month. The existing practice was to purchase this from private vendors located in far off places and supply them through ICDS programmes to the target population. The production of THR by the VOs comprising women SHG members in the village will provide them with a source of livelihood and employment opportunities. This is a brilliant example of a mechanism to create maximum impact through multiplier effects resulting in better nutritional outcomes.

An important feature of this initiative is that the legal landscape (in the form of a Supreme Court Directive in 2005) has provided enough support for operationalising this concept despite efforts to topple it. VOs will produce the THR kits as per the standards and norms, and the requirements of these kits by the ICDS programme will be met from this production. This will provide income and livelihood opportunities to the SHG members who are part of the Vos, and at the same time, address the nutritional challenges of the region. A major limitation of this initiative is the lack of any linkage with the local agricultural production system. However, once this mechanism starts functioning, further linkages can be established with the agricultural production system, which will have a multiplier effect on the local economy. This will impart purchasing power to the vulnerable sections, and can thus indirectly contribute to better nutritional outcomes.

In Amreli district, with the active leadership of the district functionaries of GLPC, two such units led by VOs in the villages of Wadiya and Babra have been started. The production unit is entirely mechanised and designed to minimise human interference in handling the ingredients, thus giving utmost importance to hygiene. This is a replicable model of convergence between livelihood missions and State-supported nutrition programmes that can address the demand-side challenges of nutrition improvement programmes.

The unit has been established by the Village Organisation (VO) by taking credit support from the State Bank of India, Wadiya branch. Out of the total investment of Rs 51 lakh for the plant, Rs. 46 lakh was taken as credit from the State Bank of India, and Rs 5 lakh was provided from the Community Investment Fund given to VOs in Gujarat. The financial flow from the operation plant will equip them to repay the credit from SBI with the income from providing the products to ICDS. They have plans to not distribute any profit for three years among the SHG members. After three years, the profit will be used to provide credit to SHG members. They also have plans to diversify into other businesses (manufacturing value-added products) by using the profits generated for the benefit of SHG members.

6.2.3 Organisation of the production process

The idea of this activity was conceived by GLPC during a training programme on interventions to improve the nutritional status of rural population. The DLMs were taken for a visit to Central Food Technological Research Institute (CFTRI), Mysore and the blueprint for this project was made. The standards and process of making the products are provided by the Food and Nutrition Department, and the technology developed and refined by CFTRI, Mysore. Afterwards, the members of SHGs who were participating in this project were given training by RSETI in operating the plant and various processes and protocols to be observed during the production. The training by RSETI facilitated securing bank credit from the State Bank of India. With the training, they could smoothly conduct the trial run of the unit. Once the unit is fully operational, they plan to conduct regular training programmes for its employees (SHG members) to ensure the production of quality products.

This VO has 61 SHGs under it which has approximately 671 members. The plant can employ about 15 persons for its day-to-day operations. All the 671 members will have equal rights to the profits generated from the plant and the future businesses they are planning for. The project is designed to provide THR to approximately 14,000 persons (including children aged 0-6 years, pregnant and lactating mothers and adolescent girls) in Kukavav block where the village is located. This will provide livelihood to nearly 150 families in the village during the first phase of the project. If proper linkages are established with the agricultural production systems in the region (primarily for the provision of ingredients for the plant) by designing a mechanism for procurement of local agricultural produce, this initiative can provide indirect benefits to nearly 1000 farm families. But this needs careful planning and convergence of several stakeholders.

The plant is designed for a capacity to produce 60 tonnes of THR per month. At present, the production planned is for 33 tonnes of THR per month. The total cost of establishing the plant was Rs. 48,82,088. This includes a fixed asset cost of Rs. 38,00,000 and a variable cost of Rs. 10, 82,088 per month. So, the unit needs approximately Rs.11 lakh per month as operating expenses. Out of the total cost, they got a bank credit of Rs 46,00,000 from the State Bank of India, Wadiya branch, at a subsidised interest rate. In addition to this, they got a grant of Rs 5,00,000 from the Community Investment Fund. The Commissioner of Women and Child Development Department (WCD) has agreed to give 25 per cent subsidy of the total cost after the plant is in operation, i.e., Vadiya Gram Sakhi Sangh will have to bear 75 per cent cost of the project. The total production cost of the planned amount of THR per month as per the current estimate is Rs. 10,82,088, and the returns at the existing prices is Rs. 13,60,632. This yields a net income of Rs. 2, 78, 544 per month to the VO. As per the project design, all the members in the VO have an equal right to the net income. However, the VO has decided that they would not distribute the net income among members for a period of three years from the commencement of production. After clearing their debt to SBI, they will distribute a share of the net income to its members. The remaining part of the net income will be utilised for providing credit support to its members and investing in future business activities of the VO.

6.2.4 Quality Control

The production unit is entirely automatic with minimum human interference for handling raw materials as well as semi-finished and finished products. The machinery used is designed for real-time monitoring of various processes and automatic packing of the finished product. Discussions with the DLM of GLPC indicated that they have clear plans for regular monitoring of the performance and make necessary interventions for improvement based on the performance. The plant has not commenced its regular operations for production. However, they have done the necessary trial runs and have performed the quality tests of the product. As per the direction of Supreme Court, a committee of nutritional experts from the Maharaja Sayajirao University of Baroda has examined and tested various quality parameters of the product. Besides, the plant has secured requisite certificates from various legal authorities for food licence and establishing industrial units for producing food products.

6.2.5 Sustainability and Replicability of the Intervention

This is an excellent example of an intervention to improve the nutritional status of women and children by utilising the institutional strength of SHGs and VOs facilitated by the Rural

Livelihood Missions. The design of the intervention is in such a manner that the investment in the programme has a multiplier effect on the regional economy in terms of generation of employment for rural women, infusing purchasing power and indirectly contributing to improved consumption of nutritious food. It also results in the transfer of benefits from such an intervention for future investments, contributing to employment generation and livelihood promotion. Participation of the beneficiaries and other stakeholders (GLPC, PRIs, and District Administration) ensures transparency, self-regulation and monitoring of the progress of the programme. The multiplier effect can be further strengthened and improved by linking the project to the agricultural production system of the region. All the input demand for operationalising the plant can be linked to be met from the local farming system. The cropping pattern of the region (wheat- groundnut) can cater to the input requirements of the production unit. The district functionaries of GLPC plan to implement this strategy once the functioning of the production unit is stabilised.

In terms of sustainability and replicability, if the production unit starts functioning and continues its production process adhering to the existing designs and protocols, it can emerge as a sustainable and replicable model for others to emulate. No need to mention that it needs continuous focused efforts to streamline the production process by addressing the problems that arise in the process and establishing linkages in the initial stages of operation. Also, a major support through handholding of such production units in streamlining their activities towards developing linkages with the agricultural production systems in the project areas. Developing agriculture-nutrition linkages will ensure the sustainability of this project and helps in achieving better nutritional outcomes.

A major difference in the nutrition value chain in Gujarat is the nature and degree of engagement of PRIs at the grassroots level. Unlike the value chain in Kerala, this is essentially a two-tier value chain with the district functionaries of livelihood mission directly engaging in establishing linkages with various nutrition and livelihood generation programmes. There is a certain level of interaction through the ICDS centres at the village level, but district functionaries also handle it through their staff at the grassroots level. The administrative control of grassroots level units of various departments (primarily the Department of Women and Child Development and Department of Health and Family Welfare) is largely centralised. The district-level administration coordinates their activities and sets priorities. From a farming system for nutrition perspective, the Department of Agriculture and Cooperation, which has to play a major role in linking the farming system in local areas with the nutritional promotion programmes, is

completely absent from any of the activities concerned with nutrition. This feature needs to be taken care of to address the constraints in realising effective nutritional outcomes in the State.

7. CHHATTISGARH

7.1 Nutritional and Health Status of Population in Chhattisgarh

7.1.1 Child Mortality in Chhattisgarh

The infant mortality rate is the number of deaths per 1000 live births of children aged below one year. According to NFHS data, the infant mortality rate of rural Chhattisgarh is 56 deaths per 1000 live births in 2015-16, as opposed to 46 deaths per 1000 live births in rural India. However, there has been an improvement in the infant mortality rate in Chhattisgarh over the last decade, from 71 deaths per 1000 live births in 2005-06 to 56 in 2015-16.

7.1.2 Nutritional Status of Children in Chhattisgarh

The nutritional status of children under five years of age can be measured using stunted (children who have a height-for-age z-score at least two standard deviations (SD) below the median for the WHO child growth standards), wasted (weight-for-height z-score at least 2 SD below the median for the WHO child growth standards) and underweight (weight-for-age z-score at least 2 SD below the median for the WHO child growth standards). In rural Chhattisgarh, about 39.2 per cent of children are stunted, according to NFHS-4 data, and it has improved significantly from the 55.7 per cent stunted child population in NFHS-3 data. Also, 39.6 per cent of children here are underweight for their age, according to NFHS-4, which is also an improvement from 50.22 underweight children, according to NFHS-3. However, the percentage of wasted children, i.e., children too thin for their height, has grown from 19.9 per cent in 2005-06 to 23.7 per cent in 2015-16. Other than an increase in wasting among the child population in rural Chhattisgarh, the other measures of nutritional status have improved analogous to rural India.

7.1.3 ICDS Scheme to Children in Chhattisgarh

The ICDS scheme aims to improve the health and nutrition of children below six years of age, pre-school of children aged 3 to 5 years, and the nutrition of pregnant women and lactating mothers. The coverage of ICDS scheme in rural Chhattisgarh is significantly better than that of rural India, as is evident from both NFHS-3 and NFHS-4. In rural Chhattisgarh, the percentage of

children aged 0-71 months who received supplementary food in areas covered by the anganwadi centres increased from 60.1 per cent in 2005-06 to 75.2 per cent in 2015-16, whereas only 53 per cent of children received supplementary food in rural India in 2015-16. Immunisation coverage of children in rural Chhattisgarh improved considerably from 48.6 per cent in NFHS-3 to 65.4 per cent in NFHS-4, and children to receive health check-ups increased from about 33 per cent to 71 per cent, far above the number of children to receive immunisation care and health check-ups in rural India (about 43 per cent in NFHS-4).

About 38.5 per cent of children aged 3 to 5 years received pre-schooling in anganwadi centres of rural Chhattisgarh in 2005-06 when only 24.4 percentage children received pre-school in rural India. In 2015-16, the number of children to receive pre-school subsequently increased to 58.7 per cent in rural Chhattisgarh and only to 42.3 per cent in rural India. Clearly, the ICDS scheme has performed better in Chhattisgarh relative to overall India in providing nutrition, healthcare and pre-school to children.

7.1.4 ICDS scheme for Pregnant Women and Lactating Mothers in Chhattisgarh

Anganwadi centres (AWC) also provide supplementary nutrition and health check-ups to pregnant women and lactating mothers. In rural Chhattisgarh, similar to AWC services to children, the coverage of services provided to pregnant women and lactating mothers is appreciable. The distribution of supplementary nutrition to pregnant women in the areas covered by AWC increased from 66.4 per cent in 2005-06 to 92 per cent in 2015-16. Similarly, supplementary nutrition was provided to lactating mothers for 65 per cent of births in 2005-06 and 91 per cent of births in 2015-16. The improvement in coverage of provision of supplementary nutrition to pregnant women and lactating mothers in overall rural India is also noticeable - almost two-fold increase from 2005-06 to 2015-16 but is still as low as only 50 per cent in 2015-16. Health check-ups of pregnant women and lactating mothers in rural Chhattisgarh are as high as 85 per cent, and 76 per cent of births, respectively, in 2015-16, as opposed to just 47 per cent and 41 per cent of births in rural India.

7.1.5 Vitamin A supplement & Anaemia in Chhattisgarh

The Government of India recommends Vitamin A supplements to children below five years as its deficiency can increase the risk of measles and diarrhoea. In rural Chhattisgarh, 8 per cent of children aged 6 to 59 months received vitamin A supplements in the past six months of the survey in 2005-06. The coverage improved to 69.8 per cent of children aged 9 to 59 months in 2015-16, although the improvement in national coverage of vitamin A supplements was not so

profound and improved from 17.5 per cent in 2005-06 to 59 per cent in 2015-16.

Anaemia is a condition caused by a deficiency in iron intake and marked by low haemoglobin levels, causing weakness, dizziness and shortness of breath. It is a common problem among children below five years and pregnant women and often requires iron supplements. In rural Chhattisgarh, the prevalence of anaemia among children aged 6 to 59 months has dropped significantly from 72 per cent to just 41 per cent of children from NFHS-3 to NFHS-4.

Clearly, rural Chhattisgarh has been performing better than average rural India in terms of health and nutrition indicators. The coverage of the ICDS scheme has been commendable in both of the study periods, 2005-06 and 2015-16. The assessment of the aspirational district programme in 2018 indicates that Bijapur district of Chhattisgarh is one among the top five districts showing improvement in health and nutrition.

7.2 Nutrition Value Chain in Chhattisgarh

The nutritional value chain in Chhattisgarh is also largely a two-tier structure, with the major policies and programmes being formulated and implemented at the first tier at the State level and in second tier at the district level. Four key departments of the State are engaged in implementing programmes for improving nutritional outcomes. They are the Department of Women and Child Development, Department of Public Health and Family Welfare, Department of School Education, and the Department of Panchayat and Rural Development. The Department of Women and Child Development implements the ICDS programme and other Central and State government programmes aimed at improving women and child health. This is done in close coordination with the Department of Public Health and Family Welfare, which focuses on issues related to immunisation, public health and maternity care. The Department of School Education carries out the most important programme of Mid-Day Meal scheme with the support of the Department of Panchayat and Rural Development. The implementation of these programmes by responsible departments at various administrative units is coordinated and monitored by the district administration through employees of the respective departments. Wherever convergence is required between two or more departments, it is largely facilitated by the district administration at the respective levels of intervention. At the grassroots level, the primary function of PRIs is largely of a facilitating role than that of coordinating for provision of a common platform for convergence and integrated action. This two-tier structure is similar to

that observed in the State of Gujarat. A detailed depiction of the nutritional value chain is presented in Figure 3.

7.2.1 ICDS Scheme in Chhattisgarh

The major programme focusing on improving nutritional outcomes in the State of Chhattisgarh is the ICDS Scheme implemented by the Department of Women and Child Development. Anganwadis have been empowered as the primary centres of nutrition, health awareness and other basic services for women, children and adolescent girls. There are 220 ICDS centres operating 43,763 anganwadi centres and 6548 mini anganwadi centres, with 27 District Programme officers, 190 Child Development Programme Officers along with 1750 supervisors to administer the programme. Around 35,000 anganwadis in the State function in buildings owned by the government, while about 10,000 operate in rented facilities.

As part of the ICDS scheme, the Fortified mix in terms of Take-Home Ration (THR) is being given to the children aged between 6 months to 3 years. Ready-to-eat food packets, weighing one kg, are distributed at the anganwadis to the beneficiaries once a week. The proposed daily food intake is 135 g for normal children, 215 g for severely undernourished children and 165 g for pregnant and lactating mothers. This provides 12.75 g of protein along with 410.19 calories. For the children in the age group of 3 years to 6 years, cooked food (105 g) along with the fortified mix as breakfast is being provided at the anganwadi centres to children aged between 3 years to 6 years. The supplements consist of ready-to-eat food (75 g), boiled chana, organic jaggery (50 g) and roasted peanuts. Severely malnourished children are given extra mix in addition to breakfast and hot cooked food. Alternatively, the beneficiaries are provided with flattened rice (Poha) so as to maintain some variety in tastes. In the case of Poha, daily 50 grams are being fed to the children arriving at the anganwadi along with ready-to-eat food, which provides them with approximately 6.37 g of protein and 205.09 calories for breakfast.

In addition to the ICDS scheme, there are two State-supported programmes, which are unique to the State. They are the Mukhyamantri Amrutum Yojana, Vajan Tyohar programme, and the Mahatari Jatan Yojana carried out by anganwadi centres across the State. Mukhyamantri Amrutum Yojana is a scheme launched to provide nutritious diet to all children aged 3-6 years. Under the scheme, sweetened and flavoured milk (100 ml) will be provided to children aged 3-6 years every Monday at the anganwadi centres.

Vajan Tyohar was formulated in response to the issues with the anthropometric data by various agencies in assessing the malnutrition levels in the State. In order to address this, the

State has come up with the concept of "VAJAN TYOHAR", held once during the year, for a particular number of days wherein the officials are required to travel to anganwadis and record the weights of all children (below the age of 5) in the village. This data is compiled at various levels and is used to assess the levels of malnutrition in various districts and blocks in the State. The Mahatari Jatan Yojana provides all the pregnant women registered in the anganwadi centre with ready-to-eat items as well as hot meals and take-home ration. The scheme also covers special care, health education, complete vaccination and iron-folic acid tablet distribution.

7.2.2 Linkages between Agriculture Production and Nutrition Programmes

The nutritional value chain in Chhattisgarh essentially consists of the stakeholders engaged and activities to implement the above-mentioned programmes. In addition to these, there are two commendable initiatives by the State government in Dhamtari and Sukma districts. These initiatives have tried to leverage the strength of local agricultural production systems in improving the nutritional outcomes of the population supported by them. The first initiative was carried out in Bhatgaon village of Kurud block in Dhamtari district. This was a joint effort on convergence mode by the Department of Women and Child Development and the Department of Horticulture coordinated by the District Administration. They could effectively converge the MGNREGA scheme with this initiative, which played an important role in creating a replicable convergence model. The scheme focused on establishing an organic vegetable garden in an area of 2 acres attached to the horticultural farm in the district. They set up a vegetable garden to grow and source vegetables for the 45 anganwadi centres within 0-5 kilometre radius of Bhatagaon village to provide food for about 750 children in the anganwadis.

A total of Rs. 12.33 lakh was allocated from the MGNREGA fund towards this project. The wage component was provided by the MGNREGA fund and this project became functional during 2016-17. They grew tomatoes, brinjal, cauliflower, French beans, green leafy vegetables and other seasonal vegetables suitable for the locality and season. The registered farmer producer organisations did the cultivation work, and the vegetables were sent to the anganwadis in the villages. It was observed that when the cultivation was taking place, the nursery could provide nearly 2 kg of vegetables to every anganwadi daily.

Along with this, awareness camps and exhibitions were conducted to make people aware of the importance of nutrition and the need to consume local organic produce. Since the

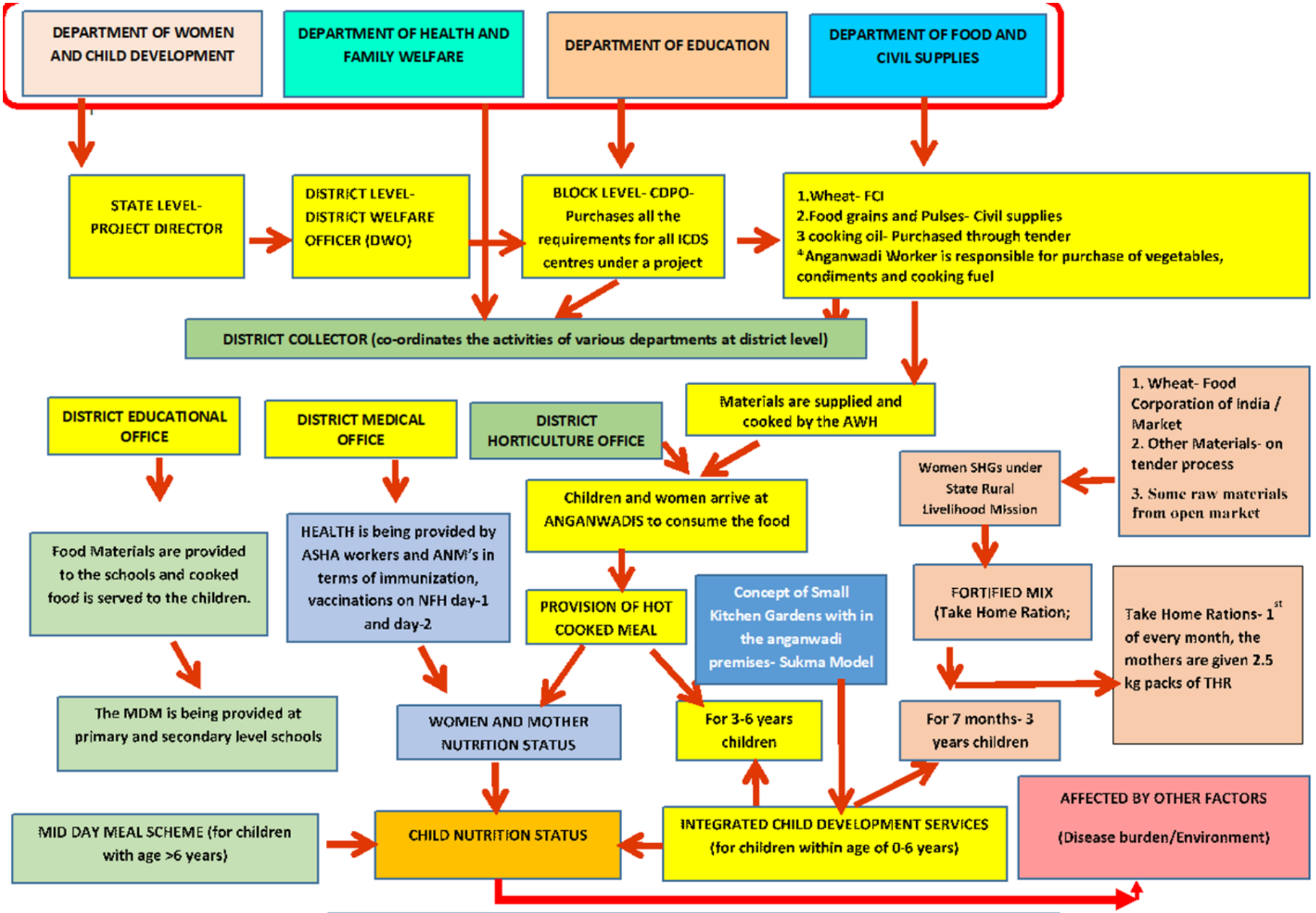

Figure 3: Nutrition Value Chain in Public sphere for Chhattisgarh

vegetables cultivated were very primitive to the local tastes and preferences, this scheme was to provide some improvements in the nutrition levels of the people staying in the peripheral areas. This also imparted knowledge and improved the awareness levels among the community and they started actively supporting this programme through similar small initiatives. The community also learned about the nutritional value of foods and the significance of improving dietary diversity for better nutritional outcomes. This has made substantial contributions to the convergence of activities and programmes of various departments, and building models that leverage agricultural nutrition linkages for better nutritional outcomes.

In addition to this, they have initiated the " Fulwari" system in the block with the support of Gram Panchayats. The Fulwari (Flower Garden) scheme consists of community-managed feeding and daycare centres. These community centres are in villages where parents or mothers volunteer to run them. The Fulwaris provide daily three hot, cooked meals to children aged six months to three years. Pregnant and lactating women also get one meal a day. The mothers create the menu, which includes each day a green vegetable to children, oil, and each child must consume a minimum of two eggs per week. Two mothers in the village volunteer each day to take care of children at the Fulwari for 6–7 hours, which allows the rest of the mothers to go to work. They do not take any remuneration for contributing their time but are allowed to have a meal at the Fulwari.

The District Panchayat reviews the programme regularly during quarterly meetings of its General Assembly. Block Panchayats review the programme during monthly meetings of the presidents and secretaries of Gram Panchayats. When the community agrees to start a Fulwari, a resolution is adopted along with the Gram Panchayat, which is informed to the Block Panchayat. To fund the activity, District Panchayats release funds to Gram Panchayats, which in turn, release funds to Village Health Sanitation and Nutrition Community headed by the Ward member and a community health worker. The committees release funds to mothers' groups to purchase utensils and supplies for the Fulwari with the help of the community health workers in maintaining accounts and records. The community health workers also assist the auxiliary nurse midwives, anganwadi workers, and accredited social health activists in providing deworming, iron tablets, take-home rations, and health checkups at the Fulwaris. The success of "Fulwaris" depends upon the convergence of the grassroots level functionaries of various departments, PRI functionaries, and community members.

7.2.3 Kitchen Gardens by Anganwadi Centres: Case of Sukma District

This was a very small initiative but an innovative model. Every anganwadi situated here had a small kitchen garden constructed within its compound. The government provides the seeds for growing crops, and the anganwadi workers are encouraged to cultivate vegetables that are suitable to the local environment. Green leafy vegetables, loki, tomatoes, etc., are being grown at the anganwadi, and the same is being used for cooking hot meals here. Since the number of beneficiaries, in general, is minimal in these areas, these vegetables cultivated regularly are enough to meet the daily needs (in addition to the food supplements already being provided under the hot cooked meal scheme) at the anganwadi. The remaining vegetables, including onions and potatoes, are being sourced through SHGs, which obtain them at a rate from the open market. This is particularly carried out in remote, inaccessible areas where depending on markets for the regular supply of vegetables is practically impossible. Such areas are often in a disadvantageous position, and hence more vulnerable to availability and access to food. These initiatives are invaluable in such situations and play a critical role in ensuring food and nutritional security among the most vulnerable communities in disadvantageous regions.

7.2.4 Take-Home Ration by SHG

In Chhattisgarh, there is an initiative by the women SHGs to organise production units to prepare THR supplied by the ICDS Centres. The THR is produced as per the norms and standards of the Department of Women and Child Development and is supplied to the ICDS centres for distribution. This is a source of income and encouragement for the entrepreneurial capabilities of the SHG women members in the region. However, the major shortcoming of this venture is the absence of proper linkages with the local farming systems.

7.2.5 Features of Nutritional Value Chains in Chhattisgarh

The nutritional value chain in operation in the State largely has a two-tier structure. The Departments of Women and Child Development, Public Health and Family Welfare, School Education and Panchayat and Rural Development form the first tier that formulates policies and programmes and sets up a platform for their implementation and monitoring. The second tier of the nutritional value chain is composed of the district administration, which coordinates the functioning of relevant units of the departments at various disaggregated levels (tehsil, block and village) in the district. Although this is largely a two-tiered structure, in certain blocks, the PRIs are involved in creating innovative mechanisms through initiatives that work towards bringing convergence between various State departments that implement programmes towards

improving the nutritional status of the population. Some initiatives develop linkages with the local agricultural production systems as well. Although these are initiatives of lesser scale and specific to select geographical regions, valuable lessons have to be learned to replicate these models on agriculture nutrition linkages in other parts of the State.

The District Administration took the first and most noteworthy initiative by bringing convergence between the Departments of Agriculture, Women and Child Development and the MGNREGA programme. This created a synergy between the agricultural production and the nutrition support programme, and infused some purchasing power into the working population, who are the most vulnerable sections of the society. This is primarily a public-supported programme that made use of effective participation of people, which contributed to better nutritional outcomes for children under six years of age.

The second laudable initiative is the organisation of self-supporting vegetable gardens attached to the anganwadis in Sukma block of Sukma district. These vegetable gardens cultivate locally grown and consumed vegetables in land attached to the anganwadis and supply their produce to prepare the food served to the children. The programme is supported by the department officials, who organise the supply of inputs for cultivation and facilitates cultivation and integration of the produce into the feeding programme of the centre. These are two examples of primarily public-supported programmes initiated to link and establish synergies between the agricultural production system and the ongoing programmes. There is a lot of scope for improvements in these initiatives to effectively leverage the linkage between agricultural production systems on which the majority of the population is dependent, and the policies and programmes aimed at better nutritional outcomes.

8. ODISHA

8.1 Nutritional and Health Status of Population in Odisha

8.1.1 Child Mortality in Odisha

Infant mortality in rural Odisha (69 deaths per 1000 live births of children below one year) was higher than the rural national average of 62 in 2005-06. However, the infant mortality rate has improved in Odisha. According to 2015-16 NFHS data, the infant mortality in Odisha is 43 deaths per 1000 live births compared to 46 deaths per 1000 live births in rural India.

8.1.2 Nutritional Status of Children in Odisha

About 46 per cent of children below the age of 5 were stunted, i.e., they were too short for their age, according to the NFHS-3 data. However, it declined to just about 36 per cent of stunted children by NFHS-4 data. Similarly, the percentage of underweight children (low weight for age) has improved in rural Odisha from 42 per cent in 2005-06 to 36 per cent in 2015-16. Oddly, the percentage of children wasted, i.e., children who are too thin for their height, marginally increased over the period from NFHS-3 to NFHS-4 whereas, according to the rural national average, all the measures for nutritional health, that is, the percentage of children who are stunted, wasted or underweight has declined from 2005-06 to 2015-16.

8.1.3 ICDS Scheme for Children in Odisha

In rural Odisha, 54 per cent of children aged 0 to 71 months and covered under the anganwadi centre, received supplementary nutrition in 2005-06, which was already double that of the national average at only 28 per cent. Similarly, health check-ups of 0 to 71-month-old children were more than double of the national average, at 44 per cent in rural Odisha compared to 19 per cent in rural India, in 2005-06. In 2005-06, immunisation care was provided to 43 per cent of children in rural Odisha, marginally better than the coverage in rural India, which was about 39 per cent. The 2015-16 NFHS data shows a 1.5-fold improvement in ICDS coverage in providing supplementary nutrition, immunisation care and health check-ups to 0 to 71-month-old children. Similarly, the improvement in ICDS in health and nutrition coverage for children in Odisha has been about 1.5 to 2 fold over the last decade.

The percentage of 3 to 5-year-old children who receive early childhood care or pre-schooling from an AWC increased from 28 per cent in 2005-06 to 63 per cent in 2015-16, which is more than a two-fold increase. This is an excellent achievement on the part of Odisha, where in rural India, the improvement has been from 24 per cent in 2005-06 to only 42 per cent in 2015-16.

The ICDS coverage in rural Odisha for the betterment of children's health, nutrition, immunisation care and early childhood care has been greater than the average coverage in rural India, as evident from NFHS-3 and NFHS-4 data.

8.1.4 ICDS scheme for Pregnant Women and Lactating Mothers in Odisha

Similarly, the provision of supplementary nutrition and health check-ups to pregnant women and lactating mothers in rural Odisha had already been for about 40-45 per cent of births in 2005-06 as opposed to only 10 to 20 per cent coverage in rural India. By 2015-16, the coverage

surged extraordinarily in rural Odisha to 80 to 90 per cent of births, which means the coverage just doubled in 10 years. The expansion of ICDS scheme in rural India is more prominent from 10 -20 per cent to 40-60 per cent, but the overall coverage is still not so impressive.

8.1.5 Vitamin A Supplement & Anaemia in Odisha

About 22 per cent of children aged 6 to 59 months received vitamin A supplements in the last six months of the NFHS-3 survey in rural Odisha, which increased to 69 per cent of children aged 9 to 59 months, according to the NFHS-4 survey. On average, in rural India, only 59 per cent of children aged 9 to 59 months received vitamin A supplements in 2015-16, 10 percentage point lower than that in rural Odisha.

Sixty-seven per cent of children aged 6 to 59 months were anaemic according to NFHS-3 (2005-06) data and gradually improved, reducing the anaemic child population to about 46 per cent in 2015-16, whereas in rural India, about three-fifths (60 per cent) of the child population are still anaemic in 2015-16.

8.2 Nutritional Value Chain in Odisha

In Odisha, the nutritional value chain, like in other States, is essentially a two-tier structure, but with variance because of the recent initiative on decentralised systems for supporting the nutrition programmes operating through ICDS centres at the grassroots level. Hence, though there is no systemic decentralised mechanism to carry out the programmes and activities, attempts have been made to mobilise and engage women's groups to support the nutrition programmes of the department. The State also has the distinction of integrating the task of organising and empowering women through SHGs, and engaging them in supporting nutritional improvement programmes by creating entrepreneurial ventures for that. The Directorate of Mission Shakti under the Department of Women Child Development and Mission Shakti exclusively focuses on the task of empowering women through SHGs. This is an indication of recognising the role of women and their livelihood status and empowerment in determining the nutritional outcomes. This process has largely been implemented through a decentralised process, which further strengthens the impact of such interventions. The nutritional value chain in Odisha is represented in Figure 4.

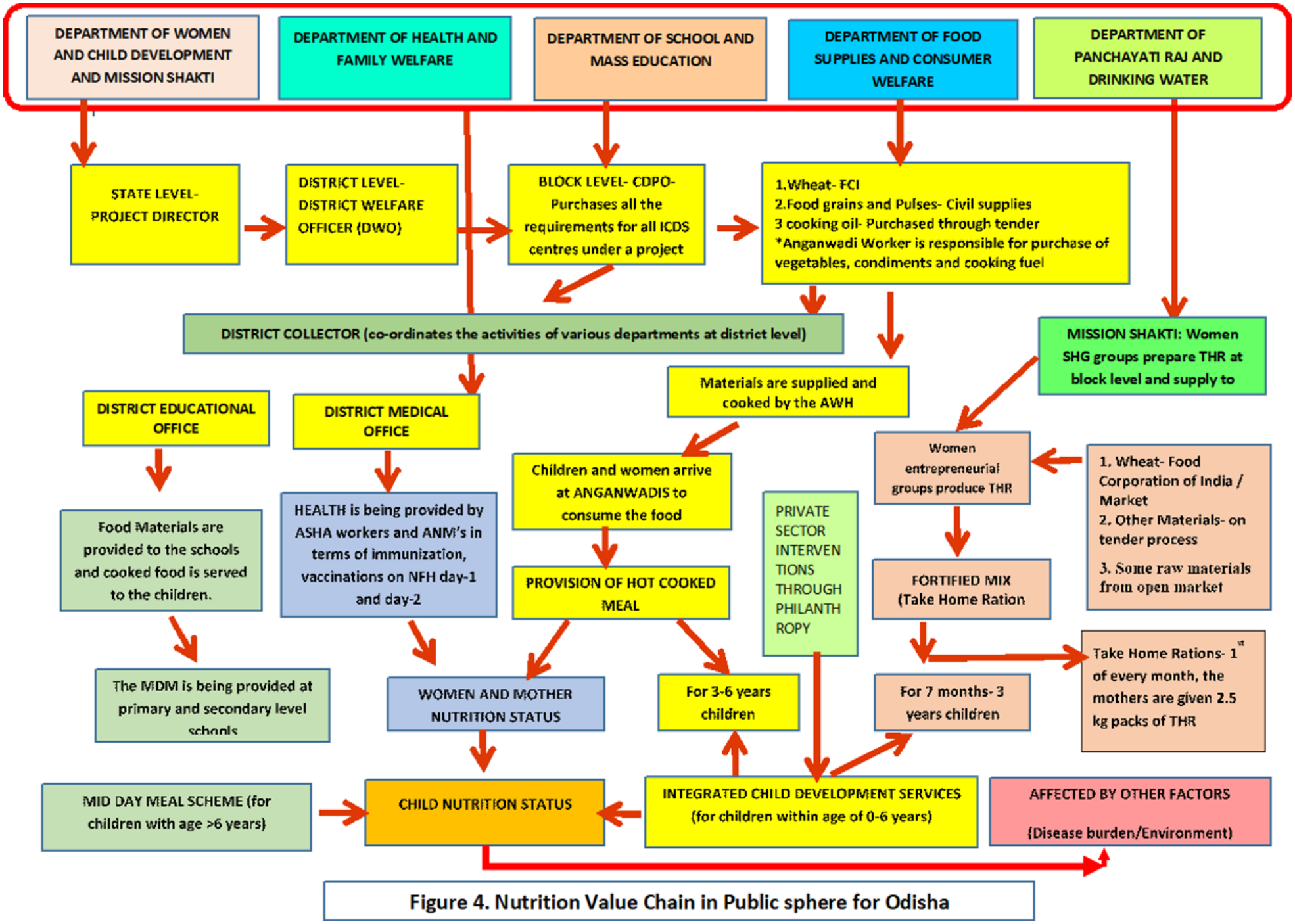

Figure 4. Nutrition Value Chain in Public sphere for Odisha

Several major programmes are implemented by the Department of Women and Child Development and Mission Shakti that focuses on women development and child welfare, which play a major role in improving the nutritional status of the population. The major programmes aimed at providing nutritional support to women and children are the following.

8.2.1 ICDS Programme

The ICDS programme encompasses an umbrella of initiatives aimed at improving the nutritional status of children, and several sub-activities focus on addressing various factors that determine nutritional outcomes. These activities are implemented by the collaborative efforts of the Department of Women, Child Development and Mission Shakti and the Department of Health and Family Welfare. The anganwadi workers of ICDS programme and ASHA workers of the Department of Health and Family Welfare are the frontline staff engaged in the implementation of various programmes.

8.2.2 Supplementary Nutrition Programme

As part of the supplementary nutrition programme implemented through ICDS, children aged three to six years are given morning snacks and hot cooked meals as per the norms. In addition to that, Take Home Ration (THR) is given to children of the age group 6 months to 3 years, pregnant and nursing mothers, severely underweight children and adolescent girls. Arrangements have been made for the home delivery of THR for those who do not attend anganwadi centres. The guidelines followed are those prescribed by the Government of India. SHGs prepare the THR at the block level, and the Food Corporation of India supplies the raw materials for its preparation. They are monitored by the district functionaries of the Department of Women and Child Development and Mission Shakti in coordination with the Civil Supplies Department.

8.2.3 MAMATA Scheme

This is a State-specific conditional cash transfer scheme aimed at improving the nutritional status and health-seeking behaviour of pregnant women and lactating mothers. It predominantly addresses the issue of maternal and infant undernutrition. The target group for this scheme is the pregnant and lactating women aged 19 and above for the first two live births except those who avail maternity benefit (employees or wives of employees of State government/Central government/PSUs).

8.2.4 Kishori Shakti Yojana

This scheme focuses on the nutritional well-being of adolescent girls in the age group of 11 - 18 years. The scheme's primary objective is to improve the nutritional, health and development status of adolescent girls, and promote awareness of health, hygiene, nutrition and family care among them.

8.2.5 SABLA (Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG)

This is also a State-specific scheme focusing on the empowerment of adolescent girls in the age group of 11-18 years. The adolescent girls of this age group will gather at the ICDS centre (anganwadi) at regular intervals. Among them, the school-going girls will meet at least twice a month and more frequently during vacations. They receive life skills education, nutrition and health education, and awareness about socio-legal issues at the centre. The scheme aims at reducing the dropout rate of adolescent girls by increasing their literacy rate and work participation. They are given awareness about health, hygiene, nutrition, Adolescent Reproductive and Sexual Health (ARSH) and family and child care, and trained to upgrade their home-based skills and life skills and tie up with National Skill Development Programmes (NSDP) for vocational skills. There is a nutrition and non-nutrition component to this scheme. The nutrition component focuses on IFA supplementation, regular health check-ups and counselling. The non-nutrition component focuses on providing life skill education, and vocational training and links them with the national skill development programmes.

8.2.6 Pustikar Diwas

This activity is conducted on the 15th of every month, focusing on children aged 0- 5 years. The programme's objective is to reduce the risk of death and disease among (0-6 years) children due to malnutrition, and prevent malnutrition in early childhood by promoting improved child feeding, caregiving, and care-seeking practices at ICDS centres, family and community levels. The programme is carried out through the convergence of the Department of Health and Family Welfare and Department of Women and Child Development, and Mission Shakti. As part of the programme, children who are severely undernourished, according to the WHO standards, are referred by AWW or ANM to the Block PHC or CHC for examination, diagnosis, management and treatment to improve their nutritional status. This is a State- specific programme implemented with care and monitored closely by the district and State-level functionaries.

The nutrition value chain in Odisha is essentially a two-tier structure, with the State at the apex level formulating policies and programmes related to nutritional improvement. At the second tier is the district administration, which implements these programmes at the grassroots level through various staff of the key departments, primarily the Department of Women and Child Development and Mission Shakti and the Department of Health and Family Welfare. The most distinguishing feature of the nutritional value chain in Odisha is the integration of women self-help groups in organising the production and distribution of food material as part of the supplementary nutrition support, including Take-Home Ration for children, pregnant women and lactating mothers. The women SHGs have been organised into production groups with entrepreneurial capabilities to establish and run production units that maintain high hygiene and quality standards. This acts as a major factor in facilitating the empowerment of women and contributing to improvements in their livelihoods, and building their capacity and entrepreneurial capabilities. Mission Shakti programme contributes to three major aspects of nutritional improvements. The first and foremost contribution is organising and empowering rural poor women through SHGs. The second important contribution is building their capacity to produce supplementary nutrition food, which is an integral part of the nutrition improvement programmes. The third contribution is in terms of improving the livelihoods of rural women supported by an entrepreneurial activity linked to a nutrition improvement programme. It will also enhance their income levels and indirectly contribute to increased dietary intake and dietary diversity.

A major shortcoming in the nutrition value chain in Odisha is the absence of a strong linkage of the nutrition programmes with the local agricultural production system. Although there is an effective organisation of women SHGs through Mission Shakti in setting up units for production of THR as part of SNP, the production process has very weak linkages with the agricultural production systems in the region. Majority of the inputs used for SNP production are procured through supply chains that have no connection with the local agriculture production and any demand for the products from the farming systems in the region is hardly generated. If this limitation is addressed, the State can significantly contribute to the improvement of nutritional outcomes.

9. TELANGANA

9.1 Nutritional and Health Status in Telangana

Telangana State was formed in 2014. Hence, the State figures are available only from the

NFHS-4 (2015-16) data, and it would be difficult to understand the pattern of the health status of children and the ICDS scheme in the State. But the data can still be compared with the national levels to understand its performance.

9.1.1 Child Mortality in Telangana

The infant mortality rate is low at 38 deaths per 1000 live births of children below one year in rural Telangana, unlike 46 deaths per 1000 live births in rural India.

9.1.2 Nutritional Status of Children in Telangana

About 33 per cent of children below the age of 5 years were stunted, i.e., were too short for their age, and were underweight, that is, they were too thin for their age, in rural Telangana. It is, however, lower than the average stunted and underweight child population in rural India, at about 40 per cent each. About 20 per cent of children who can be considered too lean for their height, i.e., are wasted in rural Telangana, which is also about 10 percentage point lesser than that of rural child population of India in 2015-16.

9.1.3 ICDS Scheme for Children in Telangana

Provision of supplementary nutrients to children aged 0 to 71 months through anganwadi centres is high in rural Telangana in 2015-16, covering three-fourths (75 per cent) of them in contrast to just half of the child population covered in rural India. Moreover, immunisation care and health check-ups are provided to more than half (about 55 per cent) of the child population (0-71 months) covered under AWCs, relative to the 45 per cent coverage in rural India.

Pre-schooling or early childhood care is availed by 55 per cent of the 3 to 5-year-old child population under AWCs, which is higher than the average coverage of 42 per cent of the child population in rural India.

9.1.4 ICDS Scheme for Pregnant Women and Lactating Mothers in Telangana

The provision of supplementary nutrients to pregnant women and lactating mothers in rural Telangana covers about 20 percentage point more births than in rural India, at 79 per cent and 75 per cent, respectively. Health check-ups for pregnant women and lactating mothers are provided for about 60 per cent of births in rural Telangana, which again covers approximately 15 -18 percentage point more of births covered in rural India in 2015-16.

9.1.5 Vitamin A supplement and Anaemia in Telangana

Vitamin A supplements provided to children of 9 to 59 months comprise about three-fourths (about 77 per cent) of the population in 2015-16, better than 60 per cent of the child population in rural India. However, the proportion of anaemic children is quite high in rural Telangana, which is about 68 per cent of children (6-59 months), about 10 percentage point higher than the anaemic child population in rural India.

9.2 Nutrition Value Chain in Telangana

A detailed analysis of Nutritional Value Chains in Telangana was carried out with the framework of agriculture nutrition linkages to understand the stakeholders and their interaction with the agricultural production systems and its components at various levels. In Telangana, the nutritional value chain essentially has a two-tier structure, similar to the States of Gujarat, Odisha and Chhattisgarh. The two-tier structure is essentially led by the Department of Women and Child Development, Department of Health Medical and Family Welfare and Department of School Education at the State level and their respective functionaries at the district level. The functionaries of these departments at the mandal and taluk levels are governed by the district. Hence, their administrative control at the second tier rests with the district level authorities. The nutritional value chain in Telangana is given in Figure 5. In Telangana, the major programmes focusing on the nutritional improvement of its population, particularly women and children, are briefly discussed below.

9.2.1 Arogyalakshmi Scheme

This scheme focuses on pregnant women and lactating mothers and is designed with the objective of improving their nutritional and health status, which plays a significant role in the nutritional status of the children. The most crucial component of Arogyalakshmi Programme is the spot feeding of "one full meal" for pregnant and lactating women at the anganwadi centre, along with the administration of Iron and Folic Acid (IFA) tablets. The scheme was introduced in all ICDS centres covering nearly 36,000 anganwadis in the State. The "one full meal" consists of rice and dal with leafy vegetables or sambar; vegetables are given to eligible members for a minimum of 25 days. In addition, they were also given one boiled egg and 200ml of milk for 30 days a month. It is estimated that the one full meal will meet 40- 45 per cent of the daily calorie and 40-45 per cent of protein and calcium requirements per day of the pregnant and lactating

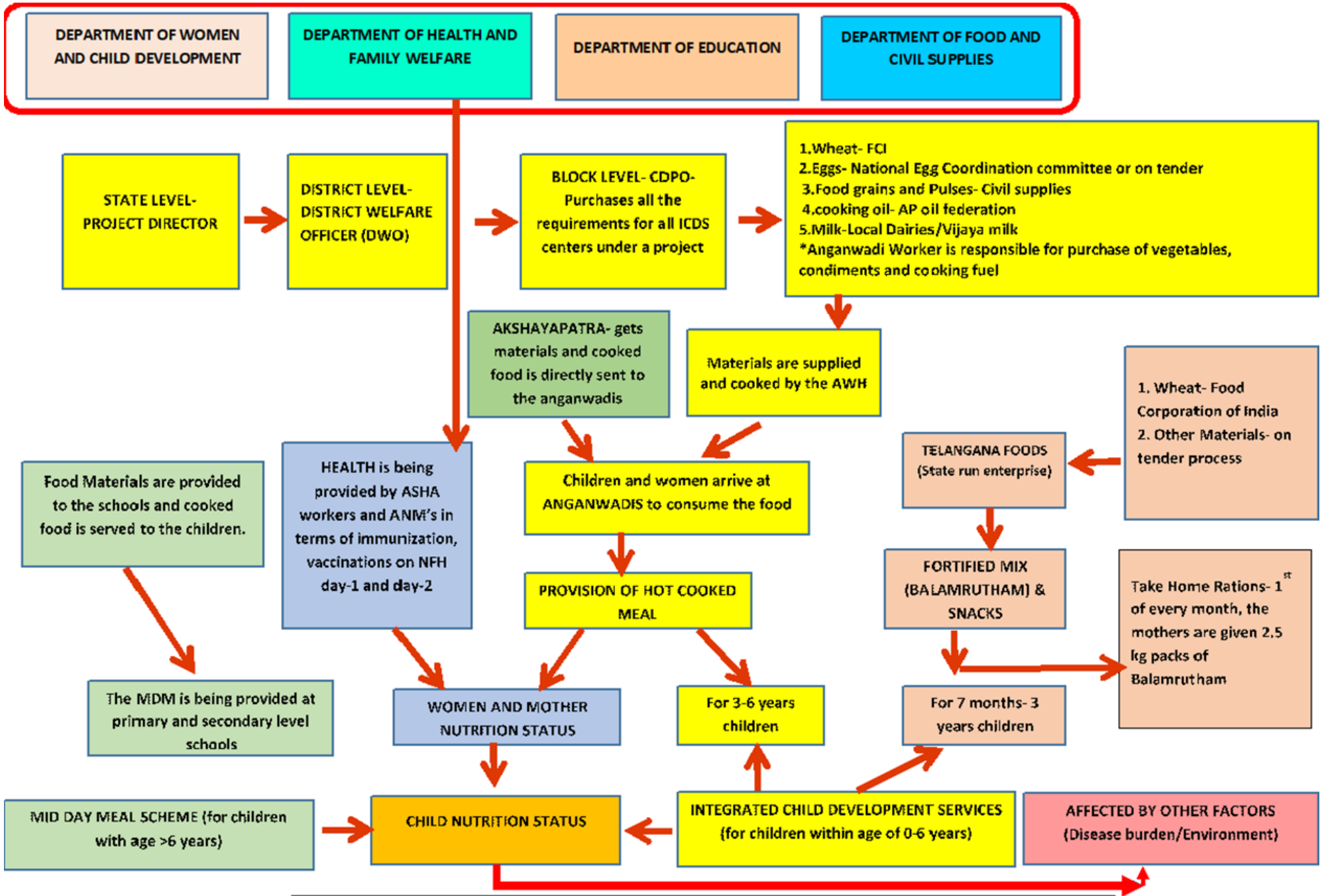

Figure 5. Nutrition Value Chain in Public Sphere in Telangana

mothers. Along with the meal, Iron and Folic Acid (IFA) tablets are also given. The children of the age group of 7 months to 3 years are provided with 16 eggs per month, whereas children of the age group 3 years to 6 years of age are provided with 30 eggs per month. A unique feature of this programme is that the women and children have to visit the ICDS centre and consume the meal, IFA, milk and eggs at the centre itself. This is also accompanied by health check-ups and monitoring vital health and nutritional status parameters. This ensures that women and children consume the nutritious food meant for them, and it also creates awareness among them about the role and importance of nutritious food and hygiene practices in improving the nutritional status of their children and themselves.

The Government of Telangana has formulated Operational Guidelines for implementing the Arogya Lakshmi programme. The essential component of the implementation strategy is the formation of Anganwadi Level Monitoring and Support Committee (ALMSC), an eleven-member committee for the overall guidance, supervision, and monitoring of the various activities undertaken by anganwadis. The food is served as per the pre-defined menu for the whole week and is decided by the ALMSC. The ALMSC meets before the 5th of every month to decide on the menu as per the availability of different foods. The anganwadi workers are responsible for procuring the food at the schools and organising the distribution amongst the population belonging to various categories. There is an anganwadi centre for every 800-1000 households in the urban areas, while one centre for 150-500 households in rural areas. The ALMSC consists of an ASHA worker, representative of the community in which the anganwadi is located (mostly a teacher of the school or a retired government servant of the locality), two mothers (one a pregnant woman and a mother of a 3 months to 6-year-old child), Sakhi under SABLA programme or an adolescent girl, two representatives from the village organisation, and the anganwadi worker. The Sarpanch or the ward member (preferably woman) serves as the Chairperson of the committee. The major responsibilities of the committee are:

a. The committee shall meet once a month on the first Nutrition Health Day (i.e., the first of every month) and create awareness of the One Full Meal Programme.

b. To ensure supply of rice, dal, oil, eggs, milk and vegetables to the AWCs to prepare meals for feeding children, pregnant women and lactating mothers.

c. Assist in making arrangements for milk supply where centralised supply provisions are not in place.

d. Create awareness amongst and enrol all eligible beneficiaries to the AWC.

e. Provide support for finalising the menu and regular functioning of the spot feeding programme

f. Ensure the attendance, quality, hygiene and other aspects of the programme

g. Certify the attendance registers of anganwadi centres to ensure smooth functioning of the centres and regular conduct of various activities.

9.2.2 Supply of Balamrutham

Balamrutham is part of the supplementary nutrition programme for children in the age group of six months to three years and it is provided through the anganwadi centres in the State. This is a preparation made with whet, Bengal gram, milk powder, oil and sugar. It is a fortified food preparation, which provides nearly 50 per cent of iron, calcium, vitamins and other Recommended Dietary Allowance (RDA) per day for a child. The composition and nutritional value of Balamrutham are given in Appendix – 1. This is distributed in 2.5 kg packets per child for a month, and the child should be served 100 gm of Balamrutham a day. In the nutritional value chain of Telangana, the production and distribution of Balamrutham –unlike in other States studied - is carried out by a public sector company. The company was started as early as 1971 to cater to the demand for Ready-to-Eat food (RTE) for its supply as part of the Mid-Day Meal Scheme. They focus on the manufacture and supply of nutritious foods to schools, pre-school children, pregnant women, and lactating mothers under the social welfare programmes of the Government of Telangana and the Government of Andhra Pradesh to improve the nutritional status of its population.

10. A SUSTAINABLE AND REPLICABLE MODEL FOR BETTER NUTRITIONAL OUTCOMES

The analysis of nutritional value chains in five States that represent different geographies and agro-ecologies in India reveals fascinating facts about the nature and status of nutrition improvement programmes in India. The analysis of trends in major nutritional and health indicators estimated by NFHS during 2005-06 and 2015-16 reveals that there has been a slow but steady progress on the nutritional front by the States through various programmes launched at the national level and implemented by States and other agencies. However, the nature of progress and its pace varies with States, and interestingly individual States have very specific challenges that need focused and customised programmes and policies to address them. The

review of policies and programmes aimed at improving the nutritional status of population in different States reveals that

a. On a larger perspective, improvement of the nutritional status of the population has found a prominent place on the agenda of national programmes and policies of the government, and this has been implemented through various programmes at the State level. There has also been a realisation of malnutrition as a development challenge. It needs to be tackled by way of programmes and policies to be implemented through a multi-stakeholder alliance that transgresses several sectors. Also, the programmes and policies are generally aimed at addressing the supply-side factors, and there is less or almost no focus on demand-side aspects. This emerges as a significant limitation in the current strategy to address malnutrition challenges in India.

b. The strategy and framework adopted for implementing nutrition improvement programmes at the national level and in several States are similar but with variations specific to the nutritional landscape of each region. Altogether, most of the programmes are implemented by the ministries or departments of Women and Child Development, Health and Family Welfare, Education, Public Distribution and Consumer Affairs and to some extent by Departments of Rural Development and Panchayati Raj. In all the States studied, this has been the composition of various departments engaged in implementing programmes and policies for nutritional improvement.

c. In all the five States studied, except in the case of Chhattisgarh, to an extent, there is no linkage between agricultural development programmes and nutrition-focused programmes. This is very evident in the composition of institutional architecture of nutrition programmes in which the activities of the Ministry of Agriculture are in no way linked to any of the nutritional improvement programmes. This is the case at the national level and also at the State level activities. In a situation where the major pathways identified to address the nutritional challenge in India have placed agriculture production and the linkages with nutrition at the centre stage of activities, the absence of institutions governing agricultural production in the alliance to fight malnutrition is a major limitation. Not only that there is a lack of convergence among the existing institutions in implementing various activities designed to address malnutrition, but also there is an absence of critical sectors required to address the malnutrition challenges effectively.

d. Though there is a lack of convergence and absence of linkages with agriculture sector in

general, there are encouraging diverse initiatives from States that shows the potential of the convergence of various types in improving nutritional outcomes. The Chhattisgarh case demonstrates the potential of linking agricultural production to nutrition programmes. It also shows that engaging communities in maintaining nutrition gardens in anganwadis serves as a source of nutrient food as well as acts as learning centres for creating nutritional awareness among women in the community. This will have maximum impact in adopting nutrition-related programmes and results in transformative behavioural changes leading to better nutritional outcomes. The case of Odisha demonstrates the role of women empowerment in enhancing nutritional outcomes. This is a key aspect that synergises the whole range of nutrition-related activities among vulnerable population. Gujarat presents an interesting case where women entrepreneurship linked to nutrition programmes contribute to improvements in livelihoods through women empowerment, and consequently better nutritional outcomes. The case of Telangana presents the possibilities of convergence between public programmes and private sector that can help in improving the efficiency of implementing nutrition improvement programmes. The most interesting and promising example is Kerala, where decentralisation has been successfully implemented relative to other States. Here, PRIs (Panchayati Raj Institutions) serve as a platform of convergence for activities carried out by four major departments that implement programmes aimed at improving nutritional status of the population. All the cases cited above point to the potential ways of improving the efficiency of ongoing nutritional programmes but need refinement and modifications for implementation at a larger scale and geographical coverage.

A summary of the main features of nutritional value chains and the nature of its linkage with the agricultural production systems in the five States is presented in Table 2.

Table 2: Major features of nutritional value chains in States studied

States	Typology of partnerships involved in nutrition programmes	Involvement of women's groups	Involvement of Panchayati Raj Institutions	Linkages with local agriculture production systems
Chhattisgarh	State led initiatives that bring convergence between various programmes	Engagement of women groups is not very active.	Minimal involvement of PRI functionaries. Involvement of district functionaries of various public programmes is promising.	Some evidences of linkages with local production system. This can be further strengthened
Gujarat	SHG led initiatives in establishing entrepreneurial ventures	Very active engagement of women groups through SHGs and other initiatives	Involvement of PRI functionaries is very minimal.	No significant linkage of nutrition programmes with agricultural production systems. There is a potential for such linkages.
Kerala	PRI – SHG convergence	Women SHGs actively involved under the umbrella of Kudumbashree	Very active involvement of PRI functionaries and convergence with relevant departments responsible for nutrition interventions.	No significant linkage of nutrition programmes with agricultural production systems. There is a potential for such linkages.
Odisha	State-SHG led initiative that is bringing convergence	Active involvement of women groups in entrepreneurial ventures related to nutrition. This is actively supported by State	Minimal involvement of PRI functionaries. Involvement of district functionaries in nutrition programmes is encouraging.	No significant linkage of nutrition programmes with agricultural production systems. There is huge potential for such linkages.
Telangana	State led initiative supported and complemented by private sector initiatives	Need more efforts for engagement of women groups in engaging with agriculture-nutrition programmes.	Minimal involvement of PRI functionaries. Involvement of district functionaries in nutrition programmes is effective.	No significant linkage of nutrition programmes with agricultural production systems. There is huge potential for such linkages.

Based on the analysis of nutrition value chains in the five study States and understanding of specific interventions in selected areas in these States, we have suggested a sustainable and replicable model that leverages agriculture-nutrition linkages for better nutritional outcomes. A representative model is depicted in Figure. 6. There are three major additions to this proposed model –in addition to what is operational in the country- and the first one is the emphasis on the convergence of various agencies at the State level and the grassroots level (at the Gram Panchayat level) facilitated by Panchayati Raj Institutions (PRIs). The second key feature is the effort to link agricultural production through suitable institutional arrangements with the activities of programmes for nutritional improvement. In this, the local and regional agricultural production systems will provide diversified food products to the public-supported nutrition programmes like the Mid-Day Meal Scheme and THR given through ICDS services. This is a crucial demand-side intervention with a larger multiplier effect in supporting the livelihoods of communities and conserving the local agricultural production systems. The third and the most important component is the empowerment of women in the community by improving their knowledge levels (specifically nutritional literacy) and livelihoods through the creation of entrepreneurial capabilities. The entrepreneurial ventures linked to the nutrition programmes (like production of THR, production and value addition of food materials to be supplied through ICDS and Mid-Day Meal scheme) will contribute to the sustainability of such initiatives and result in better nutritional outcomes.

This model will provide a platform for convergence among various institutions engaged in addressing the challenges of malnutrition. It proposes to ensure synergistic linkages between agriculture production system in the region and various nutritional programmes implemented through various agencies. The promotion of women entrepreneurship will lead a long way in improving their livelihoods and help in achieving better nutritional outcomes. This has been proposed after consultations with various stakeholders in the nutrition value chain in the States studied and refinements suggested by them after intense discussions among peer groups engaged in improving the nutritional status of their population in respective geographies.

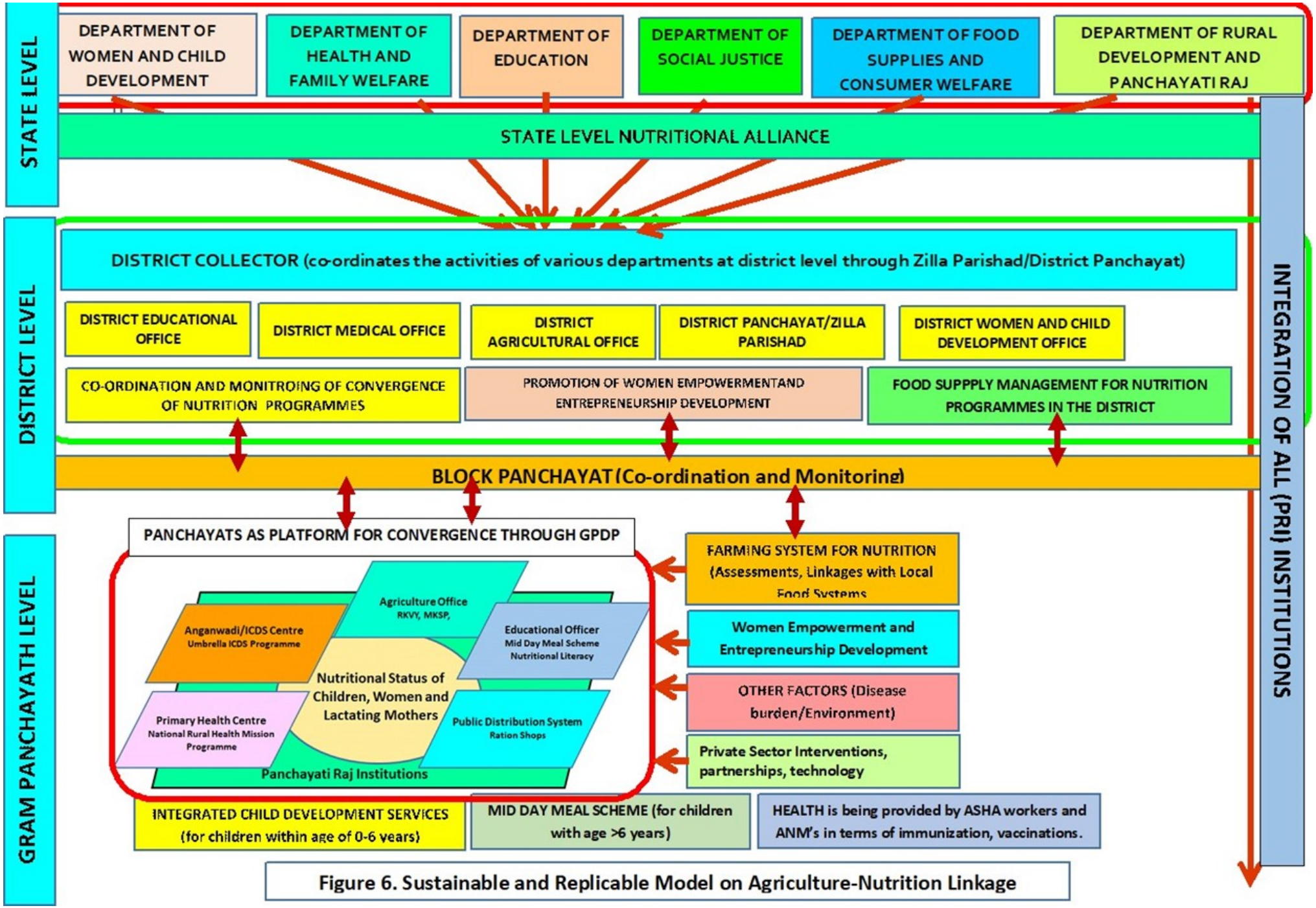

Figure 6. Sustainable and Replicable Model on Agriculture-Nutrition Linkage

11. CONCLUSIONS

Malnutrition among the population, specifically among women and children, is one of the gravest development challenges faced by the country. The government has designed and implemented several policies and programmes at the national and State level for the last four decades. These programmes have, to an extent, contributed to the improvement in nutritional levels of the population. However, the progress has been slow and varied across regions and geographies within the country. Several studies have been carried out in the Indian context to understand the pathways of nutritional linkages and the factors that influence nutritional outcomes. These studies have concluded that in a country like India, where a significant share of the population is dependent on agriculture for livelihood, nature and characteristics of agriculture-nutrition linkages play a major role in defining and determining the nutritional outcomes.

In this context, this study was undertaken with the objective of mapping, understanding and analysing the nutritional value chains existing in diverse regions of the country. Based on the analysis, it proposes a sustainable and replicable model that will enhance agriculture- nutrition linkages in consultation with various stakeholders. The methodology followed is a nutritional value chain analysis approach, which involves identifying value chain actors and processes, collecting data and information about various value chain activities, and mapping the institutions and processes involved in the value chain. This was done for the States of Gujarat, Telangana, Odisha, Chhattisgarh and Kerala. Along with this, a review of the ongoing programmes for improving the nutritional status of population implemented by the State was carried out in different regions with diverse institutional arrangements. The review revealed that

a. At the macro level, the improvement of nutritional status of the population has found a prominent place in the agenda of national programmes and policies of the government, and this has been implemented through various programmes at the State level.

b. In all the five States studied, except in the case of Chhattisgarh, to an extent, there is no linkage between agricultural development programmes and nutrition-focused programmes. This is revealed by the fact that the composition of institutional architecture of nutrition programmes, in which the activities of the Ministry of Agriculture are in no way linked to any of the nutritional improvement programmes.

c. Although there is a lack of convergence and absence of linkages with the agriculture sector in general, there are encouraging diverse initiatives from States that show the potential for the

convergence of various types in improving nutritional outcomes.

Based on the value chain analysis, a model was proposed based on experiences in agriculture-nutrition linkages in all of these States. This proposed model leverages agriculture-nutrition linkages and will eventually help realise better nutritional outcomes. The proposed model was discussed with various stakeholders in the nutrition value chain and emerged after a series of consultative processes and reviews. The major features of the proposed model are

a. Emphasis on the convergence of various agencies at the State and the grassroots levels largely facilitated by PRIs, which are the decentralised institutions of governance.

b. An effort has been taken to link agricultural production through suitable institutional arrangements with the activities of programmes for nutritional improvement.

c. Focus on empowering women in the community by improving their knowledge levels (specifically nutritional literacy) and livelihoods by creating entrepreneurial capabilities.

The proposed model has tried to address the issue of sustainability and replicability by incorporating the components of agriculture-nutrition linkage at the grassroots level, women empowerment and development of entrepreneurial capabilities among rural women. This needs further refinement to adapt to specific situations during its implementation in India's different geographies and socio-economic landscapes.

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13. APPENDIX

Appendix-1: The nutrient and the micronutrient composition of Balamrutham per 100 gm

S. No.	GoI Norms	Available Nutrients in Natural Ingredients	Fortification	Total
1	Energy (kcal)	414	0	414
2	Protein (g)	11	0	11
3	Calcium (mg)	167	200	367
4	Iron (mg)	3.1	6	9.1
5	Vitamin A (µg)	2.5	200	202.5
6	Vitamin B1 (µg)	0.3	0.3	0.6
7	Vitamin B2 (mg)	0.2	0.35	0.55
8	Vitamin C (mg)	0.5	15	15.5
9	Folic Acid (µg)	7.1	15	22.1
10	Niacin (mg)	2.3	4	6.3

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