**SECONDARY AGRICULTURE FOR SUSTAINABILITY**

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**Overview of secondary agriculture in India:**

Agriculture is undoubtedly the backbone of the economy of India with 58% of the population directly or indirectly dependent on agriculture. In India, agriculture employs about more than 50% of population and contributes around 12% of GDP. Over 70 per cent of the rural households depend on agriculture, 42 % of population are farmers.

Agricultural activities include cultivation of crops, rearing animals and birds, growing and catching fish, cultivating microbes, raising agro forestry, etc. to harvest the economic product. The aforementioned activities use natural resources such as land, water, air, biomass, sunshine, etc. and their output is intended primarily to meet the needs of human beings with respect to food, feed, fibre, etc., directly or after some primary processing; and indirectly for other living creatures( Acharya,2007)

India is undergoing a process of urbanization; the major share of growth in urban population is due to rural-urban migration and due to reclassification of rural settlements into urban. However, projections indicate that until 2050, more than 50 per cent of the country’s population will still be rural. Thereafter, if the trends continue, the urban population may start to overtake rural population. Nevertheless, agriculture and allied activities will remain a focus area of the economy, not only from the perspective of employment to half the population, but also for nutritional and food security concerns of the other 50 per cent (ICAR,2010).

Agriculture is not only the base for food security system in India but is embedded in her culture. However, a number of issues, including a lack of modern farming methods, a lackluster infrastructure, and limited access to capital and technology, have prevented Indian agriculture from realizing its full potential. With a sharp increase in the global population, demand from agriculture to feed this ever-growing population has posed a major challenge especially since, natural resource-based inputs are a major limiting factor for enhancement of production and productivity. Hence, the necessity for conserving the produce through reduction of losses gained importance leading to the adoption of suitable postharvest operations for transforming the raw materials (primary products) by primary processing or converting it to a value-added product for direct consumption or utilization as an input for further processing. In this situation, implementing secondary practices can be extremely important in maximizing India's agricultural potential. These procedures are crucial for preserving agriculture, boosting output, and upgrading farmers' standard of living. After achieving complete self-sufficiency in primary agriculture (grains, sugarcane, fruits, vegetables, milk, etc.), the nation needs to concentrate on "Secondary Agriculture" and add value to the fundamental agro-commodities to help farmers earn more money from their produce (Chandru *et al*,2011).

Agricultural activities are traditionally interpreted as a primary sector. This interpretation also infers and limits the agricultural workers to biological production and linked actions such as sowing, rearing, cultivation and harvesting. Uniquely, unlike from mining, the bulk of the output from agricultural activities, can be directly used by end-consumers (as in case of many food items), or feed the manufacturing sector (as in case of fibre, construction, etc.).

The economic value that is captured from the output of agricultural activities is, intrinsically linked to the other economic sectors. The output from a farm has notional material value only, except if consumed by farmer, until it connects with other consumers. To capture value, the agricultural output requires marketing services if monetized in its primary format as produce, or needs to integrate as feedstock with the manufacturing sector where it gets converted into a consumable product. For example, the produce needs for transport and warehousing (tertiary sector activities) to communicate the fresh onion or tomato to consumers, and there has to be demand from a textile factory (secondary sector activity) for cotton cultivators to progress.

Primary processing activities are generally defined as those activities, which do not significantly change the physical appearance i.e., shape, size, color, etc., of agri-produce. These activities include operations such as threshing, washing, cleaning, sorting, grading etc., many such unit operations are often performed at farm itself and could be mandatory before consumption of the produce. Secondary processing is the stage where the original identity of primary product is changed (e.g., milling of wheat into flour, splitting of pulses, smoking/roasting of meat, etc.). Further processing may be required for making the material useful for food, feed and other uses. All these activities which are in vogue for bringing the agricultural produce in a desired form for consumption constitute the primary agriculture. Output of these processing operations are crop residue and co-product/by-product of production and processing system. Many times they are further processed for industrial, pharmaceutical, nutraceuticals products and this process is referred to as tertiary and quaternary processing. Thus, the secondary agriculture is defined to add value to the finished agriculture and agriculture based industrial produce and generate income even from waste (Singh *et al*, 2009).

It is believed that the high value low volume products from high volume low value products through Secondary Agriculture activities can benefit the overall economy by generating employment, improving export potential, reduce dependence on imports and converting waste to wealth. The process involves cycling and recycling to realize the real potential even of an intermediary produce; i.e. to fully use and have true value as per growing needs, utility, applicability, adoptability and ever unfolding knowledge and technological domain. In the process, the ultimate aim is to sustain the system’s sustainability so that the four ecosystem services continue to be continuously provided effectively and efficiently to humanity in perpetuity. The health of Indian agriculture is evident from the fact that in spite of occurrence of various natural calamities like flood and drought, and adverse climatic events, food production is at its all time high. Despite continuous increase in production and productivity, food and nutritional security is still a challenge globally because of many different reasons. Some of them include (i) unsustainable increase in population, (ii) use of cultivable land for other activities, (iii) increasing input cost, (iv) depleting natural resources, (v) adverse climatic events including global warming, (vi) younger generation not showing interest in agriculture because of lower profitability (Kumar *et al*, 2009).

There is tremendous scope for adding further value to the main produce as well as for the utilization of various co-product/ by-product from primary agriculture as well as the post production operations, which has the capability of transforming Indian agricultural scenario if the same is adequately and appropriately utilized. Globally, many such examples are available where the by-product/co-product yields more value/profit as compared to the main product for which the crop was supposedly grown.

According to Chengappa (2013), Secondary Agriculture includes “all practices and processes, which add value to primary agricultural commodities using efficient technologies, market information and consumer preference”. A Committee on Doubling Farmers Income in India has defined the term “Secondary Agriculture” as a productive activity at enterprise level that utilizes raw material as the primary product and by-products of agriculture and other biological resources available locally in its rural agrarian neighborhood, deploying locally available skills or a high level of rural manpower, to operate/ manage/maintain the production of goods and services; and the activities can be categorized appropriately under the Micro, Small or Medium Enterprises Development (MSMED) Act 2006. The ‘Secondary Agriculture’ shall be considered as an industry whose inputs are majorly sourced from primary agriculture. It shall not be confused with food processing, because food processing industries are also dependent on the raw materials obtained from the primary agriculture. The products of Secondary Agriculture are much more complex and have diverse applications including food and feed.

Effectively, TACSA detailed the output from the activities to explain the term “secondary agriculture”. In fact, by correlating secondary agriculture to all food and non-food products it seems the term would encompass all types of industries as long as its input is a bio-resource – making secondary agriculture another terminology for all kinds of agro-industry. The “Secondary Agriculture” as explained by Prof DPS Verma (2008) is “All practices and processes which add value to the primary agricultural commodities using efficient technologies, market information and consumer preference” and covers the entire post-production system giving emphasis on unused biomaterials/byproducts obtained from primary agriculture/processing. Therefore, the secondary agriculture in the Indian context may be defined as “All practices and processes of converting agricultural produce, residues and by-products into high value commodities for pharmaceutical, industrial, medicinal and specified food uses as per market intelligence and consumer preferences for increasing farmers’ income”. High value product/compound extraction from complete biomass of a particular crop, rural industrialization and marketing are the main element of the Secondary Agriculture.

Another definition of SA could be “the industrial manufacturing of high value compounds / commodities / products such as food/feed supplements, food additives, compounds of pharmaceutical value, agri-inputs, industrial chemicals and consumer goods etc. from the raw materials obtained from the primary sources of agriculture and allied sectors, crop residues and agro-industrial by-products”. The TACSA report focuses on products of the bio-processing industries, including the secondary and advanced level of manufactured products of the industry, such as ethanol, chemicals, enzymes, biological, biopolymers, etc.

Sustainability of the agricultural production system in the changing global scenario where availability of natural resources is scarce, soil and environmental health is a concern, and enhancing value and profitability of agriculture is imperative for sustainability, the following need to be addressed on priority:

(i) Monetization of farmers’ produce

(ii) Bringing organized industry to rural areas to boost non-farm rural economy

(iii) Developing a technologically backed circular economy through value addition.

Such developments in addition to its linkage with as farmers often face problem of marketing their produce at remunerative prices. Agricultural processing level therefore through food processing companies, mega food parks to tiny cottage level industries involved in processing and value addition activities are increasing at faster rate and also yield considerable agro-industrial by-products, which are hardly being used for manufacturing very high value products (Ministry of Agriculture,2016).

To mitigate these issues secondary agriculture can play a prominent role. Promoting secondary agriculture can help attain sustainable development goals, which aim to connect primary, secondary and tertiary sectors through optimal use of inputs contributing to primary agriculture production, capturing ‘value’ in primary agricultural activities, and generating additional income at the rural enterprise level. Unless Tertiary and Advanced Tertiary Processing are linked to the primary agriculture, the profit from it will not reach the base farmer. In a sustainable domain of All Inclusive Agriculture, attention is required for both Primary and Secondary Agriculture. Agriculture domain has witnessed several capacity building/skill building initiatives in the past. With modest agriculture growth, there is a clear need for a shift towards appropriate skill development.

The secondary sector, like all other manufacturing industries, relies on a mix of highly skilled and medium skilled work force. Within the secondary sector, the units that are defined as secondary agriculture, would also require certain specialized knowledge and skills in their operations. Though secondary agriculture is being defined as units that are less capital intensive in production and are comparatively more labour intensive, the workforce would require understanding of matters related to the handling of raw material and the transforming or manufacturing operations related thereto, as well as safety and quality aspects as per the needs of each type of unit.

Examples include specialized handling, breeding and care of bees, extracting honey and wax, maintaining of bee-hives, etc. Similarly, skills are unique in enterprises that undertake pickling, jam making, mushrooms, vermin composting, ripening of fruits, preconditioning the produce for markets, segregating waste for feeding bio-energy plants, etc.

Further, technology involved is no longer static and as new technologies are developed for these activities, regular updating and up gradation of skills can also be an expected demand. The content below discusses various active schemes/ programs, their salient features and various means of enlisting them for promoting secondary agriculture, with a view to impart value to the farmers’ slack time with job avenues.

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