

By-Product Utilization: Boon for Agriculture Processing

Patil S.P.¹ and Chavan S. V.²

¹Assistant Professor, Department of Agricultural Engineering, RCSI, College of ABM, Sangli, (M.S.)

²Assistant Professor, Department of Agricultural Engineering, Sharad College of Agriculture, Jainapur, (M.S.)

SUMMARY

Availability of high quality, safe, nutritious food is fundamental need for good health and general well being of human being. Continuous supply of these foods has been major concern of civilizations all through the ages of human development. With rising urbanization and limited natural resources like agricultural land, water and energy, producing good quality and nutritious food for all is a challenge. The food supply chain starts from field and end with consumer. It consists of different stages and stakeholders starting from farmers, intermediate handler/traders, processing industry, suppliers, transport, retailer, consumer and waste managers. All these players in the supply chain needs to devise ways and means for full utilization of agricultural produce keeping the wastage (losses) to the minimum. The food manufacturing industry needs to transform agricultural resources, in addition to producing food for humans, into different component such that each of it may be used like animal feed, fertilizers, cosmetics, pharmaceuticals, bio-plastics and bio-fuels.

INTRODUCTION

Foods wastes are usually organic residues generated by the processing of raw agricultural materials into food and are made up of liquid (wastewater) and solids. The wastewater results from the cleaning processes or in the form of excessive or polluted process water. Its dry material content is typically less than 5% by mass. It possibly also contains organic or inorganic cleaning agents or disinfectants. Solid food wastes with an organic origin have remarkably high water content (mostly about 80% by mass). They are usually characterized by a constant quality and purity due to the forgone processes. The fact that these substances are removed from the production process as undesirable ingredients makes them, wastes. The term “**by-product,**” which is common in industry, points up that these are mostly concealed usable substances, often with a market value. So the wastes could be considered valuable by-products if there were appropriate technical means to produce products whose value exceeds the cost of reprocessing. Residues in this case cannot be regarded as wastes but become an additional resource to augment existing natural materials. Recycling, reprocessing and eventual utilization of food processing residues offer potential of returning these by-products to beneficial uses rather than their discharge to the environment which cause detrimental environmental effects.

Types of food by-product and wastes

Five system boundaries have been distinguished in the food supply chains (FSC) which are mainly responsible for generation of wastages.

i) Agricultural production: Wastage of agricultural resources due to environmental conditions, losses due to mechanical damage and/or spillage during harvest operation (e.g. threshing or fruit picking), curing/ pre-treatments, on-farm temporary storage and sorting of crops etc.

ii) Postharvest handling and storage: including losses due to spillage and degradation during handling, storage and transportation between farm and distribution.

iii) Processing: including losses due to spillage and degradation during industrial or domestic processing, e.g. juice production, canning and bread baking. Losses may occur when crops are sorted out if not suitable to process or during washing, peeling, slicing and boiling or during process interruptions and accidental spillage.

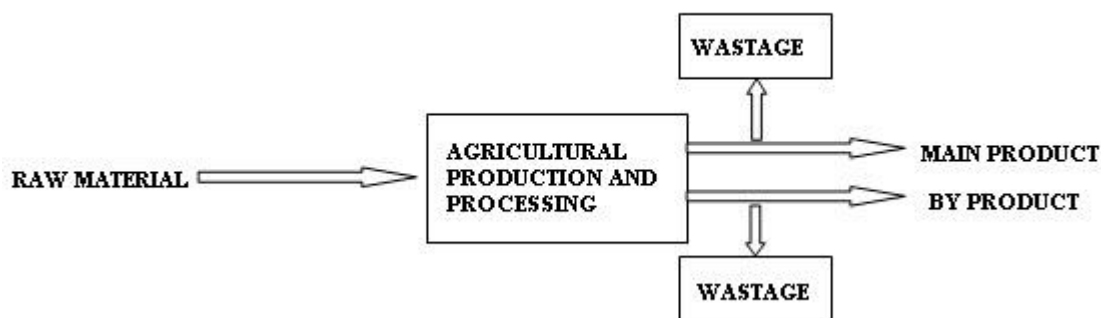
iv) Distribution: including losses and waste in the market system, at e.g. wholesale markets, supermarkets, retailers and wet markets.

v) Consumption: including losses and waste during consumption at the household level.

Magnitude of by-products/wastes in food processing

The food processing industry provides vital linkages and synergies between industry and agriculture. Raw materials - grain, livestock, milk, fruit, vegetables etc. -are converted into foodstuffs through processing

activities which may involve other inputs - energy, water, packaging and so forth. However not all inputs consumed result in useful outputs, and the result is waste.



Food processing wastes are those end products of food industries that have not been recycled or used for other purposes. They are the non-product flows of raw/processed materials whose economic values are less than the cost of collection and recovery for reuse; and therefore discarded as wastes.

Typical wastes encountered in the food processing sector

- Food wastes – shavings, peelings, stones, animal by-products etc. in addition to wasted food
- Packaging waste - packaging of incoming materials and waste product packaging
- Waste water and liquid effluent
- General factory waste

Extent of food wastage

Roughly one-third of the edible parts of food produced for human consumption gets lost or wasted globally, which is about 1.3 billion ton per year. Food is wasted throughout the food supply chain (FSC), from initial agricultural production down to final household consumption. In developed countries food gets wasted at the consumption stage while in developing and low-income countries it is mostly lost during the harvesting and in post harvesting stages of the food supply chain (table 2). Little food is wasted at the consumer level. Food wastes includes ,the kitchen waste that included vegetable peels, plate waste, leftover foods, fruit peels and egg shells from residential areas the leftover rice and similarly the kitchen waste from restaurants and hostels.

Table 1.2: Comparison between by-products and waste

Parameter	By-product	Waste
Usability	Can be processed further or employed directly as final product	Not suitable for direct use. May be used after recycling or recovery
Intention of the holder	Transform it into useful product and market the material	Usually tends to discard the material
Certainty of use	Further use is certain	Often discarded
Legislation	Further use in compliance with all relevant product, environmental and health protection requirements for specific further use.	Waste management (i e recycling, recovery, disposal) as per waste disposal laws
Examples	Animal feed Fertilizer Cosmetics Pharmaceutical Bio-plastic Lubricant Bio-energy production	The following items if no longer used: Pallet Crates Plastic Paper Metal Wood

Table 1.3: Estimated/assumed waste percentage for each commodity group in each step of FSC for South and Southeast Asia (FAOSTAT 2010d)

Commodity	Agricultural production	Postharvest handling and storage	Processing and packaging	Distribution	Consumption
Cereal	6%	7%	3.5%	2%	3%
Roots & Tubers	6%	19%	10%	11%	3%
Oilseeds & Pulses	7%	12%	8%	2%	1%
Fruits & vegetables	15%	9%	25%	10%	7%
Meat	5.1%	0.3%	5%	7%	4%
Fish & Sea food	8.2%	6%	9%	15%	2%
Milk	3.5%	6%	2%	10%	1%

Food manufacturers are increasingly acting as bio-refineries, in which agricultural raw materials are separated into a long series of products, comprising not only food but also feed, fertilizers, cosmetics, bio-fuels and others. Full utilization of this raw material in the food sector increases resource-efficiency and productivity, reduces bio-degradable waste and supports the transition to a bio-based economy (use of renewable resources).

Table 3: Food processing operations and associated waste

Category	Operations	Wastes
Raw material Preparation	Cleaning, Sorting, Grading, Peeling	Cleaning water effluent (BOD or COD), peelings, hair, feathers, grit, blood, contaminated foodstuffs
Size Reduction	Chopping, cutting, slicing, dicing, Milling of Solid foods, pulping Emulsification and homogenization of liquids	Poor quality (too coarse / fine) product with loss of nutritional / sensory characteristics Dust Agglomerates. Waste off-cuts. Fat bearing effluents from colloidal products (e.g. dairy) Risk of pathogenic contamination in emulsification (e.g. dairy)
Mixing and forming	Mixing, forming malformed pieces.	Wrongly proportioned batches, poorly mixed ingredients
Separation and Concentration	Centrifugation, Filtration Expression, Solvent extraction Membrane concentration	Separated solids (e.g. after clarification of liquids press residues (e.g. fruit juice extraction)
Fermentation and use of enzymes	Fermentation, Enzyme technology	Spent biomass.

CONCLUSION

Thus it is important to improve solid waste management in order to minimize potential human and environment risks. Almost 60 percent of solid waste contains biodegradable waste which could easily converted into manure. EM composting could be as an option of waste management operation that is cheap, eco-friendly, wealth creating and sustainable. This action will lead to waste reduction at landfill, job creation and production of organically produced food crops.

REFERENCES

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