

डॉ. पंजाबराव उपाख्य भाऊसाहेब देशमुख  
११७ वा जयंती उत्सव  
‘शेतकरी बांधवांना समर्पित’



‘शिवज्ञान’

युवा, शिक्षण व कृषी  
वर्ष ५ वे, अंक-६, डिसेंबर २०१५



ई-कॉमर्स (करिअर ओरिएन्टेड प्रोग्राम)







श्री शिवाजी कला, वाणिज्य व विज्ञान महाविद्यालय, अकोला







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# Medicinal Plants

Prof. Dr. S. P. Rothe, Head, Dept. of Botany

Plant photo	Common name / Maturity period	Botanical Name & Family	Parts Used	Average Price( Rs. / Kg )	Medicinal Use
	Awla After 4th year	Emblica officinalis Fam - Euphorbiaceae	Fruit	Rs 15 - 45/kg	Vitamin - C, Cough , Diabetes, cold, Laxative, hyper acidity.
	Ashok 10 years onward	Saraca Asoca Fam : Caesalpinaceae	Bark Flower	Dry Bark Rs 125/kg	Menstrual Pain, uterine, disorder, Diabetes.
	Aswagandha One year	Withania somniafera Fam: Solanaceae	Root, Leafs	Rs 140/ Kg	Restorative Tonic, stress, nerves disorder, aphrodisiac.
	Bel / Bilva After 4-5 year	Aegle marmelous Fam: Rutaceae	Fruit, Bark	Fruit - Rs 125 / kg Pulp - Rs 60 / Kg	Diarrhoea, Dysentry, Constipation.
	Bhui Awla with- in one year	Phyllanthus amarus Fam : Euphorbiaceae	Whole Plant	Rs 40 / Kg	Anemic, jaundice, Dropsy.
	Brahmi Indian penny worts. one year	Bacopa monieri Fam: Scrophulariaceae	Whole plant	Rs 20 per kg	Nervous, Memory enhancer, mental

	Chiraita with in one year.	Swertia Chiraita Fam : Gentianaceae	Whole Plant	Rs 300-350 / per kg	disorder. Skin Disease, Burning, sensation, fever.
	Gudmar / madhunasini, after Four year	Gymnema Sylvestre Fam: Asclepiadaceae	Leaves	Rs 50 -75 per kg	Diabetes, hydrosil, Asthma.
	Guggul after 8 years	Commiphora Wightii Fam: Burseraceae	Gum resin	Rs 80 - 100 per kg	Rheumatism, arthritis, paralysis, laxative.
	Guluchi / Gulwel With in one year	Tinospora Cordifolia Fam: Menispermaceae	Stem	Rs 20 - 25 per kg	Gout, Pile, general debility, fever, Jaundice.
	kalihari / kadlawi Five years	Gloriosa superba Fam: Liliaceae	Seed, tuber	Rs 60/kg.	Skin Disease, Labour pain, Abortion, General debility.
	Kalmegh/ Bhuineem within one year	Andrographis PaniculataFam : Acanthaceae	Whole Plant	Rs 12 – 20/kg.	Fever, week- ness, release of gas.
	Long peeper / Pimpali after two to three years	Piper longum Fam : Piperaceae	Fruit, Root	Rs 100 - 150 per kg Root - 150 per kg	Appetizer, enlarged spleen, Bronchitis, Cold, antidote.



Kamuni,  
Kakamachi  
Within one year

Solanum nigrum  
Fam: Solanaceae

Fruit/whole  
plant

Rs 40 per  
kg  
Seed - 200  
per kg

Dropsy,  
General  
debility,  
Diuretic, anti  
dysenteric.



Pashan Bheda /  
Pathar Chur One  
year

Coleus barbatus  
Fam : Lamiaceae

Root

Rs 40-50  
per kg

Kidney stone,  
Calculus.



Sandal Wood  
Thirty years  
onward

Santalum Album  
Fam: Santalaceae

Heart wood , oil

Rs 350 per  
kg

Skin disorder,  
Burning,  
sensation,  
Jaundice,  
Cough.



Sarpa Gandha  
After 2 year

Rauwolfia  
serpentina  
Fam: Apocynaceae

Root

Root - Rs  
60 per kg  
Seed - Rs  
300 per kg

Hypertension,  
insomnia.



Shatavari  
After 2-3 year

Asparagus  
racemosus  
Family: Liliaceae

Tuber, root

Rs 20 -50  
per kg

Enhance  
lactation,  
general  
weekness,  
fatigue, cough.



Senna  
With in 1 year

Casia augustifolia  
Fam:  
Caesalpinaceae

Dry Tubers

Rs 500/kg  
seed  
Rs1200/kg  
dry

Rheumatism,  
general debility  
tonic,  
aphrodisiac.












Tulsi  
Each 3 months

Ocimum sanctum  
Fam: Lamiaceae

Leaves/  
Seed

Leaves Rs  
10/kg

Cough, Cold,  
bronchitis,  
expectorant.

	Vavding. 2nd year onward	Embelia Ribes Fam: Myrsinaccac	Root, Fruit, Leaves	Rs 40-50 per kg	Skin disease, Snake Bite, Helminthiasis.
	pudina After 3 months	Mentha spicata Fam:Lamiaceae	Leaves, Flower, Oil	-	Digestive, Pain killer.
	Henna/Mehndi 1/25 years	Lawsonia innermis. Fam: lytharaceae	Leaf,Flower, Seed	L – 50/kg Powder- Rs75/kg	Burning, Steam, Anti Inflammatory.
	Gritkumari /korphad. 2nd-5th yr.	Aloe Vera Fam: Liliaceae	Leaves	Fresh L- Rs 5/kg Juice 90 Per Kg	Wound healing, Skin burns & ulcer, laxative
	Sada phuli Periwinkle	Catharanthus roseus. Fam: :Apocyanaceae	Whole Plant	Root Rs50/ kg Lvs- Rs 25S-Wp- Rs 10 kg	Leukamia, Hypotensive Antispasmodic , Antidote.
	Bhrungraj	Eclipta alba Fam: Compositae	Seed/ Whole plant	Powder-Rs 60/kg	Anti- inflammatory, Digestive, hair tonic.
	Sweet chitrak Perennial	Plumbago zeylanica Fam: Plumbaginaceae	Root, Rootbar	-	Appetiser, Antibacterial, Anticancer.
	Rakta Chitrak	Plumbago Indica Fam : plumbaginaceae	Root, Root bar	-	Indyspepsia, colic, imflammation, cough.
	Kochila /nirmali. 15 yrs	Strychnos nuxvomica Fam: Loganiaceae	Seed	-	Nervous, Paralysis, healing wound.



Hirda

Terminalia  
Chebula  
Fam:  
Combretaceae

Seed

Rs. 80 per  
K  
Powder

Trifala, wound  
ulcer, leprosy,  
inflammation,  
Cough.



Bihada

Terminalia  
bellerica  
Fam:combretaceae

Seed, Bark

Fruit - Rs  
20/k  
Powder- Rs  
100/k

Cough,  
Insomnia,  
Dropsy,  
Vomiting,  
Ulcer, Trifala.



Gokhru  
CrawlingPuncture  
Vine/1 yr

Tribulus terrestris  
Fam:  
Zygophyllaceae

Whole Plant

Plant-Rs  
10/K  
Fruit -Rs  
15/k

Sweet cooling,  
Aphrodisiac,  
appetizer,  
Digestive,  
Urinary  
disorder



Neem

Azadirachta -  
indica  
Fam : Meliaceae

Rhizome

Rs 45/k

Sedative,  
analgesic,  
epilepsy,  
hypertensive.



Anantamool  
Indian Sarap  
sarilla

Hemidesmus  
Indicus  
Fam:  
Asclepiadaceae

Root/ Leaf

Rs 45/k  
root powder  
Rs 90/k

Appetizer,  
Carminative,  
aphrodisiac,  
Astringent.



Sweet Flag  
1 yr

Acorus calamus  
Fam : Araceae

Rhizome

Rs 45/K

Sedative,  
analgesic,  
epilepsy,  
hypertensive.



Vasaka

Adhatoda vasica  
Fam :  
Acanthaceae

Whole Plant

Leaf - Rs  
25/ k

Antispasmodic,  
respiratory,  
Stimulant.









Nagkeshar/  
Nag Champa

Mesua Ferrea  
Fam : Guttiferae

Bark, Leaf,  
Flower

Flower - Rs  
120/k  
Powder Rs

Asthma, Skin,  
Burning,  
Vomiting,

	Khus gawat.	Vetiveria Zizynoides Fam : Poaceae / Graminae	Root	175/k Flower - Rs 120/k Powder Rs 175/k	Dysentery, Piles. Hyperplesia, Burning, ulcer, Skin, Vomiting.
	Mandukparni . Indianpenny wort	Centella asiatica Fam : Umbelliferae	Whole plant	Per kg/125	Anti inflammatory, Jaundice, Diuretic, Diarrhoea.
	Kainchaka/ khajkohli.	Mucuna pruriens Fam : Fabaceae	Root, Hair, Seed, Leaf	-Rs 60/kg Rs120/40	Nervous, Disorder, Constipation, Nephroaphy, Strangury, Dropsy.
	Dalchini Perenial Shrub	Cinnamomum Zeylanicum Fam : Lauraceae	Bark, Oil	-RS150/	Bronchitis, Asthma, Cardiac, Disorder, Fever.
	Kaya kuda	Holarheena antidysentrica Fam: Apocynaceae	Bark, Seed	-Rs300/kg	Scabies, Antipyretic, Amoebic dysentery.
	Kantakari / Akranti Perennial	Solanum Xanthocarpum Fam : Solanaceae	Whole Plant, Fruit, Seed	-Rs 60/kg	Diuretic, Antiinflammatory, Appetiser, Stomachic.

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1. Zj Ì : A{ceZr ({~Q¶ E[aO\$g) : ho  
Zj Ì'nbVrb n{hb\$ Zj Ì Anho A{ceZr  
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 6. Zj Ì : AnDm(Jmf m Oó r Zna') 'YnzY/a  
 {OH\$Sæ{VH Sæ AnDm(Z' nE H\$Uma\$ AnDmFøm  
 Zj ÌnV EH\$M VOñdr, 'ÉqngnaI m MH\$H\$Unam  
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 OY' bēqm i°\$ H\$e Agēqm Var H\$noH\$  
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 andà{VH\$nae°\$ Cîm AgVo nU ~nbÉqny  
 Xnf, Vnb/amUm, 'mónUm, H\$znMo and,  
 gYrdmV, X'm nj nKnV, {óqngm 'ngrH\$  
 nmi rMm{dH\$na

dj : øm Zj ÌnMm AnanUqdy Anho H\$UAJæ\$  
 åhUOo *Aquilaria Agalldeha*. øm Üqlo  
 I nbSom, X'm CMH\$, dmV H\$' \$ AnU  
 gnydmV {R-H\$ H\$UmaoJU Anhv.

7. nuzdgy : (nmb<sup>3</sup>g) ønbm Xlgao Znñ  
 (~r0:n Oó' Zna') ñdJnñ\$ 'hmXna, gKa  
 M' H\$Umao Mna Vnao AnH\$na KangnaI m øm  
 Zj ÌnV OY' bēqm AnMZ, 'i' i. øm  
 Éqngqm VH\$nar N\$VrV H\$' \$, X'm I nbSom Ago  
 'å' qgnMo{dH\$na hnb/nV.

dj : øm Zj ÌnMm AnanUqdy Anho ~ny  
 øm Üqlo {'i Umao dēbrMZ hm {gVnbnKr,  
 H\$' \$ {nÎnem H\$, Ym H\$' r H\$aU\$ I nbSēqnda  
 Aà{V', j qand, 'v and, nMZ e°\$  
 dmT{dUnam AgēqmZo 'i' i, AnH\$neqm H\$' r  
 hnb/nV.

8. nūq : (Sæ0:n H\$H\$) nmf ' {hYqny aml ^a  
 {XgUma\$ ho Zj Ì øm Zj Ìnda OY' Umeqm  
 CXmîm Yqngqr, Xd Éqm AnU AnZ\$kr AgVnV.  
 ho Zj Ì gñVr, {dUm A{YH\$na øm gneqngm  
 Mnjb Anhod i°\$bmCf nXnbmZUma\$Anho  
 øm Zj ÌndaMo and XnhH\$ Zgbo Var {XK<sup>©</sup>  
 'WVrMo AgVnV. W\$æ, dmV, nmbMo {dH\$na,  
 AnMZ, AnV\$enMo {dH\$na, 'Yw b, H\$Yga  
 BÉqngkr AnOra hnb/nV.

dj : qnni, knZeanqym AceEW, ~Wxnaqym  
 ~nVrdy dXnd°H\$ni nngyZ nAq Rabm Anho  
 g^ndVnbMo dmVndaU eUX H\$aUnam Anho  
 H\$' \$, {nÎnzmeH\$, {df' Åda, H\$' r, H\$Ø> Xnh,  
 dmVnXnf, j q, nmbMo {dH\$na, a°\$nAqym  
 H\$H\$andnda gnbrMm H\$nt:n qngdm qnni nAqym  
 gnbrMm Mhm (H\$nt:n) nni>H\$, e°\$sdYF\$  
 AgVno

9. Anucfm : øm Zj ÌnV bú' U Zj Ì Agbr  
 åhUVnV. B\$OrV (Pr0:n SñqS\$nar) øm Zj Ìnda  
 OY' Umeqm i°\$mM ~ny AnSdm AgVno  
 ñd^nd gñV, {Tæm Wn\$Efram r, gñ ngdÌ,  
 Kam-Ob AnT> àHVr gX<sup>©</sup> dnZw, nmq XpI U\$  
 W\$æVnn, H\$' \$-I nbSom AnU Ogy, AnMZ,  
 'Yw b, H\$Yga, (EdMndH\$na) AgVnV.

dj : ZmH\$ea qH\$dm ZmMm \$m AnMZ Jgy,  
 gnyrXp r, H\$' \$ny I nbSom ( 'Ob AEqy  
 gndmgH\$ AgVnV VnoZmMm \$m)

10. 'Km : (abqlog) Zj ÌnV nmb / ghm Vnao  
 AgVnV. øqm Zj Ìnda OY' bēqm i°\$mM









# Agriculture of India

Ajay Oimbe

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The history of agriculture in India dates back to the Rigveda. Today, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP (Gross Domestic Product) in 2013, about 50% of the total workforce.

The economic contribution of agriculture to India's GDP is steadily declining with the country's broad-based economic growth. Still, agriculture is demographically the broadest economic sector and plays a significant role in the overall socio-economic fabric of India.

India exported \$39 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide, and the sixth largest net exporter. [Most of its agriculture exports serve the developing and least developed nations of the world.

## Overview

As Per the 2010 FAO world agriculture statistics, India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, select fibrous crops such as jute, several staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples. India is also the world's second or third largest producer of several dry fruits, agriculture-based textile raw materials, roots and tuber crops, pulses,

farmed fish, eggs, coconut, sugarcane and numerous vegetables. India ranked within the world's five largest producers of over 80% of agricultural produce items, including many cash crops such as coffee and cotton, in 2010. India is also one of the world's five largest producers of livestock and poultry meat, with one of the fastest growth rates, as of 2011.

One report from 2008 claimed India's population is growing faster than its ability to produce rice and wheat. Other recent studies claim India can easily feed its growing population, plus produce wheat and rice for global exports, if it can reduce food staple spoilage, improve its infrastructure and raise its farm productivity to those achieved by other developing countries such as Brazil and China.

In fiscal year ending June 2011, with a normal monsoon season, Indian agriculture accomplished an all-time record production of 85.9 million tonnes of wheat, a 6.4% increase from a year earlier. Rice output in India also hit a new record at 95.3 million tonnes, a 7% increase from the year earlier. Lentils and many other food staples production also increased year over year. Indian farmers thus produced about 71 kilograms of wheat and 80 kilograms of rice for every member of Indian population in 2011. The per capita supply of rice every year in India is now higher than the per

capita consumption of rice every year in Japan.

India exported \$39 billion worth of agricultural products in 2013, making it the seventh largest agricultural exporter worldwide, and the sixth largest net exporter. This represents explosive growth, as in 2003 net export were about \$5 billion. India is the fastest growing exporter of agricultural products over a 10-year period, its \$39 billion of net exports is more than double the combined exports of the European Union (EU-28). It has become one of the world's largest suppliers of rice, cotton, sugar and wheat. India exported around 2 million metric tons of wheat and 2.1 million metric tons of rice in 2011 to Africa, Nepal, Bangladesh and other regions around the world.

Aquaculture and catch fishery is amongst the fastest growing industries in India. Between 1990 and 2010, Indian fish capture harvest doubled, while aquaculture harvest tripled. In 2008, India was the world's sixth largest producer of marine and freshwater capture fisheries, and the second largest aquaculture farmed fish producer. India exported 600,000 metric tons of fish products to nearly half of all the world's countries.

India has shown a steady average nationwide annual increase in the kilograms produced per hectare for various agricultural items, over the last 60 years.

These gains have come mainly from India's green revolution, improving road and power generation infrastructure, knowledge of gains and reforms. Despite these recent accomplishments, agriculture in India has

the potential for major productivity and total output gains, because crop yields in India are still just 30% to 60% of the best sustainable crop yields achievable in the farms of developed as well as other developing countries. Additionally, losses after harvest due to poor infrastructure and unorganized retail cause India to experience some of the highest food losses in the world.

## **History**

### **History of agriculture in India**

Vedic literature provides some of the earliest written record of agriculture in India. Rigveda hymns, for example, describes plowing, fallowing, irrigation, fruit and vegetable cultivation. Other historical evidence suggests rice and cotton were cultivated in the Indus Valley, and plowing patterns from the Bronze Age have been excavated at Kalibangan in Rajasthan.

Bhumivargaha, another ancient Indian Sanskrit text, suggested to be 2500 years old, classifies agricultural land into twelve categories: urvara (fertile), ushara (barren), maru (desert), aprahata (fallow), shadvala (grassy), pankikala (muddy), jalaprayah (watery), kachchaha (land contiguous to water), sharkara (full of pebbles and pieces of limestone), sharkaravati (sandy), nadimatruka (land watered from a river), and devamatraka (rainfed). Some archaeologists believe rice was a domesticated crop along the banks of the Indian river Ganges in the sixth millennium BC. So were species of winter cereals (barley, oats, and wheat) and legumes (lentil and chickpea) grown in Northwest India before the sixth millennium BC. Other crops cultivated in India 3000 to 6000 years ago, include sesame, linseed,

safflower, mustards, castor, mung bean, black gram, horse gram, pigeonpea, field pea, grass pea (khesari), fenugreek, cotton, jujube, grapes, dates, jackfruit, mango, mulberry, and black plum. Indian peasants had also domesticated cattle, buffaloes, sheep, goats, pigs and horses thousands of years ago. Some scientists claim agriculture in India was widespread in the Indian peninsula, some 3000–5000 years ago, well beyond the fertile plains of the north. For example, one study reports twelve sites in the southern Indian states of Karnataka and Andhra Pradesh providing clear evidence of agriculture of pulses (*Vigna radiata* and *Macrotyloma uniflorum*), millet-grasses (*Brachiaria ramosa* and *Setaria verticillata*), wheats (*Triticum dicoccum*, *Triticum durum/aestivum*), barley (*Hordeum vulgare*), hyacinth bean (*Labiab purpureus*), pearl millet (*Pennisetum glaucum*), finger millet (*Eleusine coracana*), cotton (*Gossypium* sp.), linseed (*Linum* sp.), as well as gathered fruits of *Ziziphus* and two *Cucurbitaceae*.

Some claim Indian agriculture began by 9000 BP as a result of early cultivation of plants, and domestication of crops and animals. Settled life soon followed with implements and techniques being developed for agriculture. Double monsoons led to two harvests being reaped in one year. Indian products soon reached the world via existing trading networks and foreign crops were introduced to India. Plants and animals—considered essential to their survival by the Indians—came to be worshiped and venerated.

The middle ages saw irrigation channels reach a new level of sophistication in India

and Indian crops affecting the economies of other regions of the world under Islamic patronage. Land and water management systems were developed with an aim of providing uniform growth. Despite some stagnation during the later modern era the independent Republic of India was able to develop a comprehensive agricultural programme.

### **Agriculture and colonialism**

Over 2500 years ago, Indian farmers had discovered and begun farming many spices and sugarcane. It was in India, between the sixth and fourth centuries BC, that the Persians, followed by the Greeks, discovered the famous "reeds that produce honey without bees" being grown. These were locally called pronounced as *saccharum*. On their return journey, the Macedonian soldiers carried the "honey bearing reeds," thus spreading sugar and sugarcane agriculture. People in India had also invented, by about 500 BC, the process to produce sugar crystals. In the local language, these crystals were called *khanda*, which is the source of the word *candy*.

Prior to 18th century, cultivation of sugar cane was largely confined to India. A few merchants began to trade in sugar - a luxury and an expensive spice in Europe until the 18th century. Sugar became widely popular in 18th-century Europe, then graduated to becoming a human necessity in the 19th century all over the world. This evolution of taste and demand for sugar as an essential food ingredient unleashed major economic and social changes. Sugarcane does not grow in cold, frost-prone climate; therefore, tropical and semitropical colonies were

sought. Sugarcane plantations, just like cotton farms, became a major driver of large and forced human migrations in 19th century and early 20th century - of people from Africa and from India, both in millions - influencing the ethnic mix, political conflicts and cultural evolution of various Caribbean, South American, Indian Ocean and Pacific island nations.

The history and past accomplishments of Indian agriculture thus influenced, in part, colonialism, first slavery and then slavery-like indentured labor practices in the new world, Caribbean wars and the world history in 18th and 19th centuries.

### **Indian agriculture since 1947**

In the years since its independence, India has made immense progress towards food security. Indian population has tripled, but food-grain production more than quadrupled; there has thus been substantial increase in available food-grain per capital. Prior to the mid-1960s India relied on imports and food aid to meet domestic requirements. However, two years of severe drought in 1965 and 1966 convinced India to reform its agricultural policy, and that India could not rely on foreign aid and foreign imports for food security. India adopted significant policy reforms focused on the goal of food grain self-sufficiency. This ushered in India's Green Revolution. It began with the decision to adopt superior yielding, disease resistant wheat varieties in combination with better farming knowledge to improve productivity. The Indian state of Punjab led India's green revolution and earned itself the distinction of being the country's bread basket. The initial increase in production was centred on the irrigated areas

of the Indian states of Punjab, Haryana and western Uttar Pradesh. With both the farmers and the government officials focusing on farm productivity and knowledge transfer, India's total foodgrain production soared. A hectare of Indian wheat farms that produced an average of 0.8 tonnes in 1948, produced 4.7 tonnes of wheat in 1975 from the same land. Such rapid growths in farm productivity enabled India to become self-sufficient by the 1970s. It also empowered the smallholder farmers to seek further means to increase food staples produced per hectare. By 2000, Indian farms were adopting wheat varieties capable of yielding 6 tonnes of wheat per hectare.

Men and women at work in rice paddy fields in Tamil Nadu. With agricultural policy success in wheat, India's Green Revolution technology spread to rice. However, since irrigation infrastructure was very poor, Indian farmer innovated with tube-wells, to harvest ground water. When gains from the new technology reached their limits in the states of initial adoption, the technology spread in the 1970s and 1980s to the states of eastern India — Bihar, Odisha and West Bengal. The lasting benefits of the improved seeds and new technology extended principally to the irrigated areas which account for about one-third of the harvested crop area. In the 1980s, Indian agriculture policy shifted to "evolution of a production pattern in line with the demand pattern" leading to a shift in emphasis to other agricultural commodities like oilseed, fruit and vegetables. Farmers began adopting improved methods and technologies in dairying, fisheries and livestock, and

meeting the diversified food needs of India's growing population. As with Rice, the lasting benefits of improved seeds and improved farming technologies now largely depends on whether India develops infrastructure such as irrigation network, flood control systems, reliable electricity production capacity, all season rural and urban highways, cold storage to prevent food spoilage, modern retail, and competitive buyers of produce from the Indian farmer. This is increasingly the focus of Indian agriculture policy.

### **Irrigation**

#### **Irrigation in India**

Indian irrigation infrastructure includes a network of major and minor canals from Indian rivers; groundwater well based systems, tanks, and other rainwater harvesting projects for agricultural activities. Of this groundwater system is the largest. Of the 160 million hectares of cultivated land in India, about 39 million hectare can be irrigated by groundwater wells, and an additional 22 million hectares by irrigation canals. In 2010, only about 35% of total agricultural land in India was reliably irrigated. About 2/3rd cultivated land in India is dependent on monsoons. The improvements in irrigation infrastructure in last 50 years have helped India improve food security, reduce dependence on monsoons, improve agricultural productivity and create rural job opportunities. Dams

used for irrigation projects have also helped provide drinking water supplies to a growing rural population, control flood and prevent drought-related damage to agriculture.

As of 2011, India had a large and diverse agricultural sector, accounting, on average, for about 16% of GDP and 10% of export earnings. India's arable land area of 159.7 million hectares (394.6 million acres) is the second largest in the world, after the United States. Its gross irrigated crop area of 82.6 million hectares (215.6 million acres) is the largest in the world. India is among the top three global producers of many crops, including wheat, rice, pulses, cotton, peanuts, fruits and vegetables. Worldwide, as of 2011, India had the largest herds of buffalo and cattle, is the largest producer of milk and has one of the largest and fastest growing poultry industries

#### **Major crops and yields**

The following table presents the twenty most important agricultural products in India, by economic value, in 2009. Included in the table is the average productivity of India's farms for each produce. For context and comparison, included is the average of the most productive farms in the world and name of country where the most productive farms existed in 2010. The table suggests India has large potential for further accomplishments from productivity increases, in increased agricultural output and agricultural incomes.

# Green Revolution in India

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Green Revolution in India was a period during which India increased its yields due to improved agronomic technology. It allowed less developed countries like India, to overcome chronic food defects. The "revolution" began in the 1960s, but it's confirmed that it began in 1953 through the introduction of high-yield crop varieties and application of modern agricultural techniques, and led to an increase in food production in India. The main development was higher-yielding varieties of wheat, which were developed by many scientists, including American agronomist Dr. Norman Borlaug, Indian geneticist M. S. Swaminathan, and others. The Indian Agricultural Research Institute also claims credit for enabling the Green Revolution, in part by developing rust resistant strains of wheat.

The introduction of high-yielding varieties of seeds and the increased use of chemical fertilizers and irrigation led to the increase in production needed to make India self-sufficient in food grains, thus improving agriculture in

India. The methods adopted included the use of high yielding varieties (HYV) of seeds along with the use of modern farming methods.

The production of wheat has produced the best results in fueling self-sufficiency of India. Along with high yielding seeds and irrigation facilities, the enthusiasm of farmers mobilized the idea of agricultural revolution. Due to the rise in use of chemical pesticides and fertilizers there were negative effects on the soil and the land such as land degradation.

Problems addressed

## **Low irrigation**

The well irrigated and permanently irrigated area was only 17% in 1951. The majority part of area was dependent on rainfall and, consequently, agriculture suffered from low level of production. The green revolution was possible due to adequate water supply through irrigation. The government undertook a number of minor, major and multipurpose irrigation projects to supply sufficient water to cultivable lands so that the dependence of farmers on rainfall reduce to great

extents. The government also made provisions for digging canals hand pumps etc. for adequate and more water supply. Going forward, the government should also create enabling mechanisms to fuel the growth in quality seed production. Public sector spending on irrigation, rural infrastructure (storage, post-harvest and connectivity) and credit availability are the key inventions which will encourage farmers to invest in newer technologies as his returns would be better.

### **Frequent famines**

Famines in India were very frequent during the period 1940s to 1970s. Due to faulty distribution of food, and because farmers did not receive the true value for their labour, the majority of the population did not get enough food. Malnutrition and starvation was a huge problem.

### **Lack of finance**

Small and marginal farmers found it very difficult to get finance and credit at economical rate from the government and banks, hence, fell as an easy prey to the money lenders. They took loans from "Zamindars".

### **Lack of self-sufficiency**

Due to the traditional agricultural practices, low productivity, and to feed growing population, often food

grains were imported that drained away scarce foreign reserves. It was thought that with the increased production due to the Green Revolution, government can maintain buffer stock and India can achieve self-sufficiency and self-reliability.

Agriculture was basically for subsistence and, therefore, less amount of agricultural product was offered for sale in the market. Hence, the need was felt to encourage the farmer to increase their production and offer a greater portion of their products for sale in the market. The new methods in agriculture increased the yield of rice and wheat, which reduced India's dependence on food imports. 49% of people in India are employed in agriculture.

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कुंदन बोरकुटे

विशाल भोजणे

सचिन शर्मा

अजय ओईम्बे

विशाल इंगळे

प्रविण तळोकार

प्रेम पाठक

प्रविण उंबरकार

कु. सोनाली शेंडे

कु. मयुरी मानकर कु.डॉ. प्राजक्ता पोहरे

कु. मुक्ता माळी

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प्रविण उंबरकार

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